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The U. S. Supreme Court and the U. S. Mining Law.

WITH A NOTICE OF THE STEMWINDER AND BUNKER HILL CASES.

BY R. W. RAYMOND.

Every mining suit reaching the U. S. Supreme Court is inevitably entangled and cumbered with numerous incidental questions. It is, of course, an appeal, and usually has passed through two courts already. The original complainants may or may not be the appellants at Washington. The grounds of appeal may involve the original merits of the complaint, or may have arisen in the treatment of the case by the courts below. The whole record is subject to review; and, although questions of fact are supposed not to be re-tried by the U. S. Supreme Court, the approval or reversal of judicial rulings below, concerning the admission or legal effect of evidence, may often affect the validity of the findings of fact. Moreover, every step of the proceedings through which the case has come up to the last tribunal is open to criticism, and a failure of formal regularity at any point may require a decision, throwing the whole proceedings back for repetition, and not settling at all the fundamental questions of the construction of Federal law in the case. In many such instances, the U. S. Supreme Court has practically said: "Since our present decision would be necessary, whatever be the underlying issues of the case, we will not now consider those issues."

The result of these conditions has been, that, although it is nearly 40 years since the passage (1866) of the first U. S. law for the exploration and sale of public mineral lands in certain States and Territories, and 36 years since the passage (1872) of the second,—the "law of the apex," which is substantially the present law—many important questions of construction under both these statutes (but especially under the latter) still await the answer of our highest tribunal. Over and over, such questions have been carried up to Washington, only to be shipped back again, wrapped in all their original uncertainty, because of some irregularity in the address or contents of the package.

The U. S. Supreme Court is not to blame for this protracted series of disappointments. The primary condemnation rests upon Congress, for its enactment of laws which, as everybody knows, cannot be applied until the courts have decided what on earth they mean. Our State legislatures are even more culpable in this respect; and the consequence all over the country is, that courts are spending the time and strength of legal experts (judges and lawyers) in determining the constitutionality and meaning of statutes which the common, unlearned citizen is legally assumed to understand and obey. In other words, our courts are perpetually forced, because our legislatures do not know how, to *legislate*. And the performance of this more or less inappropriate and preventable function seriously impairs their discharge of the chief duty for which they were created, namely, the swift, certain and inexpensive execution of justice according to law.

The lower courts often venture tentative decisions, knowing that such opinions are subject to review upon appeal. But the U. S. Supreme Court acts under the weight of the consciousness that from its judgment there is no appeal; and, according to my observation, its constant and anxious desire is, first, to do justice to the parties actually before it, and, secondly, while so doing, to declare and interpret the law in such a way as not to establish precedents which might work injustice in future cases.

Even before I became a member of the bar, I had the honor of addressing this Court, upon its own invitation, upon a point of mining law; and I can heartily testify, from personal experience as well as observation, that no other tribunal could exhibit greater desire for information, greater willingness to confess ignorance (if such confession be necessary to the obtaining of such information), or greater independence of all consider tions outside of the intelligent exposition and just administration of the law. I have had occasion, more than once, to criticize and deplore some of its mining decisions, the consequences of which I believed it had not foreseen; and I still think (in common with many eminent practitioners and authorities) that the Court will be hereafter embarrassed, and perhaps obliged to retract or modify certain of its constructions of the law, in the face of such consequences. But nobody that I ever heard of doubts for a moment its perfect and fearless sincerity. In my judgment, it has honestly done its best in dealing with the problems forced upon it by the crude legislation of Congress.

The foregoing general remarks are suggested by two recent decisions of the U. S. Supreme Court under the Federal mining law. It is not necessary to analyze these decisions in detail. Hitherto, I have endeavored, through papers in the *Transactions* of the American Institute of Mining Engineers, or contributions to *The Mineral Industry* and THE ENGINEERING AND MINING JOURNAL, to keep pace with such utterances of the U. S. Supreme Court as involved the final construction of the U. S. statutes concerning mineral lands. Doubtless, many decisions of more or less importance under this head may have been overlooked by me, under the pressure of other work. But, whatever may have been thus omitted, I have made it a general rule not to discuss, for the information of readers of the JOURNAL, those details of mining cases and decisions which possess a local interest only. Questions of location, abandonment, relocation, survey, etc., or even of special geology (such as the position of a given hanging or foot-wall), pertain to the special case; and while they may involve problems or principles worthy of wider discussion, do not necessarily require consideration in a critical record of the judicial interpretation of the U. S. "mining law." Moreover, the consideration of geological problems, in particular, cannot well be undertaken by one who has not personally studied the ground. And, finally, the decision of such geological questions in one case has little or no legal value as a precedent for another case.

The recent decisions to which I refer were handed down Jan. 8, 1906, in two important suits, popularly known as "the Stemwinder" and "the Bunker Hill" extra-lateral right cases, in both of which the Bunker Hill & Sullivan Co., of Idaho, was the original complainant, and is the final victor. I have not seen the full official report of these.

1. The Stemwinder case presents collateral complications of which I need name but one. Namely, there was (as I infer from the summary and diagrams before me), an intervening amendment of the lines of the location upon which the complainant relied. Apparently, the Court construed this act as a legal abandonment of the territory contained in the first lo-

cation, but not in the amended one, while it refused to give to the locator the benefit of his new lines as to additional ground, already covered by the rights of other claims, junior by original location, but senior to the amended location. The result seems to have been that the locator, by amending his location, lost something on one side, and gained nothing on the other. If that statement is substantially correct, I can only say that the decision seems to me entirely just and proper.

Apart from this and all other collateral complications (such as the position and course of the "lode" in question, and of its hanging-wall, and the application of the well established rule that when the course of the located lode crosses two opposite and parallel "side-lines," of the location, these lines become the legal "end-lines," for the determination of the extr -lateral right), this case presents apparently but one question, which may be stated in general form as follows:

B having located upon a lode, upon which A had already made an adjoining location, and the course of the lode being such that the extra-lateral rights of A upon its dip cover a zone, obliquely crossing the portion of the lode which would otherwise (i. e., if B were the senior locator) belong by extra-lateral right to B, is B entitled to the possession of the lode beyond, and (on the dip) below, the zone to which A has a prior title? In other words, does the interpolation of the ground unquestionably belonging to A cut off B's rights altogether, or simply break the continuity of B's ownership, leaving it unimpaired beyond the break?

This is not by any means a new question. The principle involved was pointed out, many years ago, in the earliest criticisms of the U. S. statute, as an element of future difficulty in its administration.[1] It was hypothetically included in the discussion and decision of the famous "Sitting Bull" case, in 1884 and later. Yet, so far as I can recall, this is the first time the practical application of the rule (implied, I think, in previous decisions) has been made by our Supreme Court. In this case, an extra-lateral right, crossed and superseded for a considerable distance by a similar and superior right, is declared to exist unimpaired, beyond that interruption, in territory the surface-locators of which, perhaps, never dreamed of hostile claims of underground ownership from a source so distant.

In my judgment, this is unquestionably the only possible construction of the existing law. The Act of 1866 gave the locator the right to "follow" his vein "to any depth," etc. The Act of 1872 (the present law) gives him the "exclusive right of possession and enjoyment" not only of the surface of his location, but also (between certain boundary planes) of all veins, the apexes of which lie under that surface, "throughout their entire depth." A single phrase covers the grant both of the surface and of the extra-lateral title. It is the same for both—"exclusive possession and enjoyment." If a part of the estate thus granted to a locator has been already similarly granted to another, the second grant is of course void as to that part; but it remains valid as to the remainder.

The decision in this case is, therefore, entirely logical, and was to have been expected. It presents no special novelty, except as a fresh illustration of the operation of the "Law of the Apex," prophesied a quarter of a century ago, and only just realized by the U. S. Supreme Court. The remark of Judge W. E. Church, of Dakota, in connection with his decision of the "Sitting Bull" case in 1884, is still appropriate: "This case affords another exemplification of the unfortunate results attendant upon the purpose of the Government to dispose of orebodies as things distinct from the soil." But Uncle Sam, as the owner of the public mineral lands, may be as big a fool as he likes in disposing of them; and even the U. S. Supreme Court cannot "construe" common sense into his proceedings, beyond a certain limit.

2. The second case, above mentioned as "the Bunker Hill case," requires little comment. It turned, apparently, upon the question of the course of the hanging-wall of the lode concerned. If this course, as claimed by one party, was correct, the lode did not pass under two opposite and parallel location-lines, and the extra-lateral rights of the location would be correspondingly limited, according to the principles laid down in former decisions. If the other side was right, then the lode crossed two opposite and parallel side-lines, which thereby became the legal end-lines, and determined the extra-lateral right. In accepting the latter view, the Court adopted in this case, as it had done in the Stemwinder case, the principle that the limit of profitable ore was to be regarded as the hanging-wall. The foot-wall of the deposit was admitted to be well defined by a fissure. The decision of the Court as to the position of the hanging-wall cannot be fairly judged without a critical study of all the geological evidence. At all events, it is merely the determination of a local fact, and, as such, not a controlling precedent. In any future case, involving the position of a hanging-wall, that fact will have to be proved by adequate evidence.

Mortars and concretes made from puzzolan approximate in tensile strength similar mixtures of Portland cement, but their resistance to crushing is less, the ratio of crushing to tensile strength being about 6:1 or 7:1 for puzzolan and 9:1 to 11:1 for Portland.

[1]See the *Report of the Public Lands Commission*, Washington, 1880, and my paper, "The Law of the Apex" (1883), *Trans.* A. I. M. E. Vol. XII, p. 387, and the Appendix thereto, p. 677.

Practice in Stoping.*

BY WAGER BRADFORD.

I believe in a man working his machines as near together as possible, preferably on adjoining benches, if the ground admits, whether he is bringing the benches down or working back from the stope bottom. The latter system is, of course, inapplicable in steep stopes. In such, safety requires that the benches be followed down, but in a stope of 35° dip or less my preference is to open out the bottom from the winze, undercutting as far as the first box hole on each side, and gradually forming the whole of each face into benches, extending from winze to box hole; then starting at the bottom to work back to the last bench, return to the bottom, break out the dead end and work, retreating again, and so on. It is evident that drills should be kept on adjoining benches to maintain the sequence; no man should blast his own front and back holes bored on the same shift, and where a bench does not break properly, it must be put in shape before the work proceeds.

With this system the ground always breaks away from the machine and toward the stope boxes, thus materially aiding in shoveling; the benches are never so buried with broken rock as when they are carried down and the leader is thus more easily followed; there is less tendency to bore holes into the hanging wall, with the consequent increase in waste, and the machines lifted from the bench they have drilled today, are safe on the one they must drill on to-morrow, and, if time admits, may be rigged up and left standing for the next shift, thus saving time. The system lends itself to the shaping of pillars on the lower side, and by starting at the right distance above the pillar and benching down to it, the face of the stope, when the pillar is holed, is in such shape that the benches above and below readily merge into each other. Finally, this system requires less room than others.

*Abstract of discussion in *Journ.* Chem., Met., and Mining Soc. of So. Africa, Nov. 1905, p. 163.

Coal in Portugal.

One of the principal factors that has retarded industrial expansion in Portugal is the absence of an adequate coal supply. There are deposits of coal and peat, but the quality is inferior and the quantity comparatively small. A coal mine has been worked for some years in the neighborhood of Oporto, which yields a hard coal suitable for domestic use, and at Figuéra da Foz and at Leiria there are deposits of lignite; at Buarcos a mine is in course of development. At present all the coal consumed by the manufacturing factors and railway companies is imported from Great Britain.

The Colonial Coke Co's Plant.—II.

(EDITORIAL CORRESPONDENCE)

The oven plant of the Colonial Coke Co., whose mine at Smock, Fayette county, Pa., was described in our last number, comprises 500 ovens, which is about the maximum size of single plants in the Connellsville and Lower Connellsville regions. Of these, 130 ovens have been in use for a number of years, 270 are two years old, and the remaining 100 are only just built. The unfinished condition of the few still uncompleted, gave an excellent opportunity to observe the process of construction.

The bee-hive oven retains its monopoly of the field. Fig. 1 shows the construction of the typical bee-hive oven. They are grouped in long batteries, either "nested" or in a single line. The former arrangement economizes space, some masonry, and half the length of track needed for charging; the single line arrangement gives smoother operation to the ovens.

The accepted dimensions are 12.5 ft. inside diameter, and 8 ft. clear height; the dome is spherical and springs from the circular walls at 1.75 ft. above the floor. The foundation is prepared by building up (from a firm stratum) parallel walls of dry masonry, using the flat slabs of sandstone or limestone, that fortunately are abundant in the coal regions. Circular masonry rings are then grouped inside the rectangle thus formed, and are carried up to the same level. The entire space within the parallel walls, including the circular spaces, is then filled up to the yard level by thorough ramming, with yellow clay soil, which likewise is abundant.

On this foundation the walls of the ovens are laid up. The material is fire brick, tapering towards one end on all four sides, and laid radially in yellow clay. A 6.25-ft. pole, swinging from a post driven at the center, guides the laying of the brick. Large, specially shaped brick are used around the oven door, and the top is finished by a fire-brick tapering ring, in segments, which serves as a key to the dome and leaves an 18-in. round hole for charging. The floor, higher by 8 inches at the back, is paved with fire-brick tiles, 15 inches square and 3 inches thick. Two parallel, dry-masonry walls are then built with a batter of 2 in 12, to the level of the tops of the domes, so as to enclose the ovens on two sides. The oven door is reinforced by a cast-iron frame, having notches in the front edges of its side members, into which a cross-bar can be lodged to facilitate the handling of the drawing tools. The wall immediately around this door is finished in red brick. The outside of the domes are plastered thinly with fire clay, and the space between and above them is solidly filled with yellow clay, taken from just beneath the grass roots in the river bottoms. The progress of this work is well shown in Fig. 2. This clay filling serves to retain the heat so that a fresh charge, if introduced reasonably soon after the drawing of the preceding charge, will kindle itself. A clay free from sand is imperative, since a quartzose loam would quickly sinter around the bee-hive and obstruct any necessary repairs.

To carry the weight of the charging track, transverse stone walls between adjacent "bank" ovens may be brought up to the level of the oven tops, or with "block" ovens, square piers of red brick laid in lime mortar may be started from the original foundation stratum and brought up to the charging level. In either case, the rails are bedded in flat grooves cut into the tops of sandstone slabs which cap the walls or the piers. A line of water pipe is laid along the front of each battery, with taps at convenient intervals for the attachment of hose for quenching the coke.

The lay-out of the grounds at Smock is shown in Fig. 3. Space for a shipping track, a spur from the railroad, is left between two batteries, and is sunk so as to bring the car floor below the "yard" on which the men work. All trestles are of the most approved steel construction. The larry is a square steel hopper, holding six tons of coal, mounted on an electrically driven truck, taking power from a trolley wire at one side. A trailer, similar in construction, but having no motor, may be coupled to the motor-driven one. The larry can discharge on both sides through chutes raised and lowered by hand winches. No door is necessary at the bottom of the hopper; the upright position of the chute itself prevents the flow of coal.

The practice at Smock is simplified by adaptability of the coal without any crushing or washing. The larry takes its load of six tons underneath the storage bin at the end of the tipple and delivers it through the round hole in the top of an oven still hot from its previous charge. A new oven has to be heated for a week or more, or if a hot oven cannot be promptly re-charged, it is kept hot by a small feed of coal. The work is arranged so that alternate ovens in the row shall be in blast, while the intermediate ones are being drawn or charged. The front door of the oven is walled up with fire-brick and sealed with a plaster of yellow mud. Water, and the more volatile hydrocarbons, come off first in a thick yellow-white cloud; as the temperature rises, and as the seal in the front door shrinks down from the top, letting in a small supply of air, the cloud bursts into flame with a dense black smoke which continues in diminishing volume for 40 hours. When flame is no longer seen at the surface of the charge, the front door is unstopped and a stream of water from a 15-foot length of iron pipe, connected by hose, to the water main, is injected. When the coke has been sufficiently "watered" it is drawn by hand rakes, loaded with coarse forks into wheelbarrows and wheeled to the standing railroad cars.

The usual charge for one oven is 5.5 tons and this occupies 48 hours in coking. Since work is suspended on Sunday, the charge on Friday and Saturday is increased to 6 tons, and the time to 72 hours. This increased duration of the

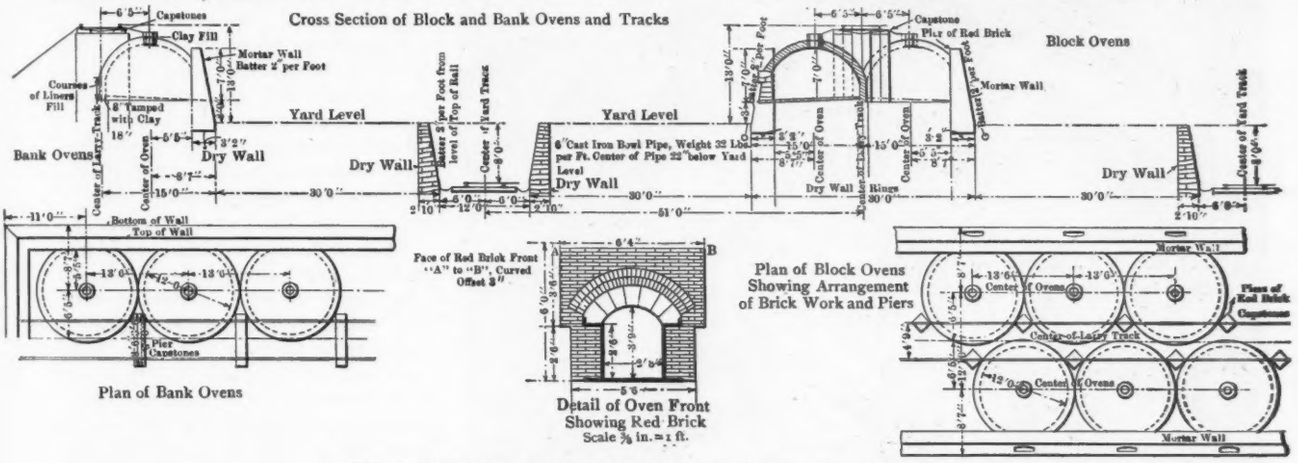
Cross Section of Block and Bank Ovens and Tracks
Block Ovens
Bank Ovens
Yard Level
Dry Wall
Mortar Wall
Capstone
Clay Fill
Courses of Liners Fill
Plan of Bank Ovens
Plan of Block Ovens Showing Arrangement of Brick Work and Piers
Detail of Oven Front Showing Red Brick
Scale ⅜ in. = 1 ft.

FIG. 1. BANK AND BLOCK CONSTRUCTION OF BEE-HIVE COKE OVENS.

process yields a superior, or "foundry" coke; the 48-hour product is less hard, and is branded "furnace" coke. Six tons of coal yield a little over four tons of coke.

Colonial coke, though made from the Pittsburg seam, is growing in favor and has already several large contracts to its credit, placed among furnace operators who were formerly satisfied with nothing but true Connellsville. The following analysis of Colonial coke was reported at different dates by the Girard Iron Co.:

	I.	II.
Volatile Matter	0.72%	0.30%
Fixed Carbon	87.68	89.79
Ash	11.60	9.91
Sulphur	0.72	0.90
Phosphorus	0.015	0.011
Total	100.735	100.911

For sake of comparison, the following analyses are given: III, Colonial coke of the 48-hour variety; IV, Bessemer coke, a typical Connellsville product; V, Washington coke, a product of the "Klondike" region, also in the Pittsburg seam, lying between the Monongahela and the Youghiogheny rivers. The analyses are by the Girard Iron Co.:

	III.	IV.	V.
Volatile	1.00%	0.88%	0.90%
Fixed Carbon	88.42	88.28	87.80
Ash	10.58	10.94	11.21
Sulphur	0.98	1.08	1.07
Phosphorus	0.007	0.010	0.012
Total	100.987	101 190	100.992

A long series of analyses by the Wharton, (N. J.) furnaces showed sulphur between the extreme limits, 0.633, and 1.03%; and ash between 8.59 and 11.32%.

Labor at a typical 400-oven plant will require about 500 men on the payroll. Of these, 200 will be miners and 160 to 170 of them will actually be at work every day mining coal. The roll of oven drawers will number about 100, of whom 80 will be at work every day. Each drawer is allotted five ovens, two being drawn on one day and three on the next. He is paid $1.15 for each oven drawn. A strong man, by taking the place of one who is disinclined to do his full day's work, can sometimes draw three ovens a day regularly.

The features to be noted in connection with the coke industry of this and adjacent districts are: The employment of run-of-mine coal; the universal use of the bee-hive oven; and the preponderance of manual labor at the ovens.

FIG. 2. CONSTRUCTION OF BLOCK OF BEE-HIVE OVENS.

Economy in Explosives.*

BY T. LANE CARTER.

Recently, I had the pleasure of meeting Dr. Nahnsen and of talking with him on explosives in general. He made a suggestion and asked me to see it carried out. It arose over the discussion which has taken place in regard to sand tamping between cartridges. Dr. Nahnsen suggested that by the use of a small 3-in. stick, placed in the hole in the middle of the charge, a small saving in explosives might be effected.

I asked the miners to try this experiment; the reports which they made varied considerably, due probably to failure to carry out the instructions properly. One miner carried out his instructions to the letter; instead of using five sticks, he used 4½, and his report was favorable. He said his holes had broken very well.

I have not enough data to speak authoritatively, but I think it is an interesting experiment to try. It might, at least, get the miners into the habit of reducing their explosives by fractions of a stick. Many of them will not try to save less than a stick. They will use a whole stick too much, but if we can get them into the habit of saving even half a stick or quarter of a stick, there will be a considerable saving in explosives. The stick of wood is not round. It is simply a square stick cut from the dynamite box. Suppose an ordinary hole will take four sticks of dynamite, two are first placed in the hole, then the small 3-in. stick of wood, next one stick of dynamite on top of the wood and finally a half stick as the primer.

Palladium has many valuable and interesting properties. In color, it is midway between silver and platinum, but it is not as white as silver, nor does it possess the disagreeable luster of platinum.

In rope transmission the depression of the rope amounts to about 3 ft. per 100 in the driving part of the rope, and 6 ft. per 100 in the slack part.

Four States, Pennsylvania, West Virginia, Indiana, and Ohio, produced 93.3% of the entire value of natural gas in the United States in 1904. Pennsylvania alone produced 47% of the entire value.

*Abstract of remarks in *Journ.* Chem., Met., and Mining Soc. of So. Africa, Nov. 1905, p. 162.

The Wallaroo and Moonta Mines.*

BY L. HANCOCK.†

Mining for copper on Yorke Peninsula dates back to just before 1860. The Wallaroo mines are about six miles east, and the Moonta mines about 12 miles south of Port Wallaroo. Both properties are connected by Government railway with the Port, where the company's smelting works are located.

At the Wallaroo mines the lodes traverse a metamorphic schistose rock, with a direction approximately east and west. The various ore-bearing strata at the Moonta mines are composed chiefly of porphyritic rock, and the lodes (speaking generally) bear north and south.

The dressed ore from Wallaroo has, throughout recent times, averaged about 11%, that from Moonta about 20% of copper, excepting that in later years it has been 2 or 3% lower. For a long time the vein stuff as raised to surface at both properties has contained on the average from 3 to 4% copper.

Recently immense accumulations of tailings and slimes from mechanical dressing have been subjected to hydro-metallurgical treatment, affording good profits.

For about 30 years the Wallaroo mines and the smelting works were one concern, while the Moonta mines were worked independently, selling their ore to the Wallaroo company. The latter, being a private company, published no records; but from what information is available it would appear that during its separate existence £2,229,096 of copper was extracted, besides nearly £339,000 produced from purchased ores. Apparently about £430,254 was distributed in dividends.

These copper values do not include those from the Moonta company, whose published statements show that £5,396,146 worth of copper was raised, of which £1,168,000 was disbursed abong shareholders. The Moonta mines have the distinction of being the first mining company in Australia to pay in dividends a total of £1,000,000, notwithstanding that the rich gold reefs of Victoria had been operated for years before the Moonta was discovered.

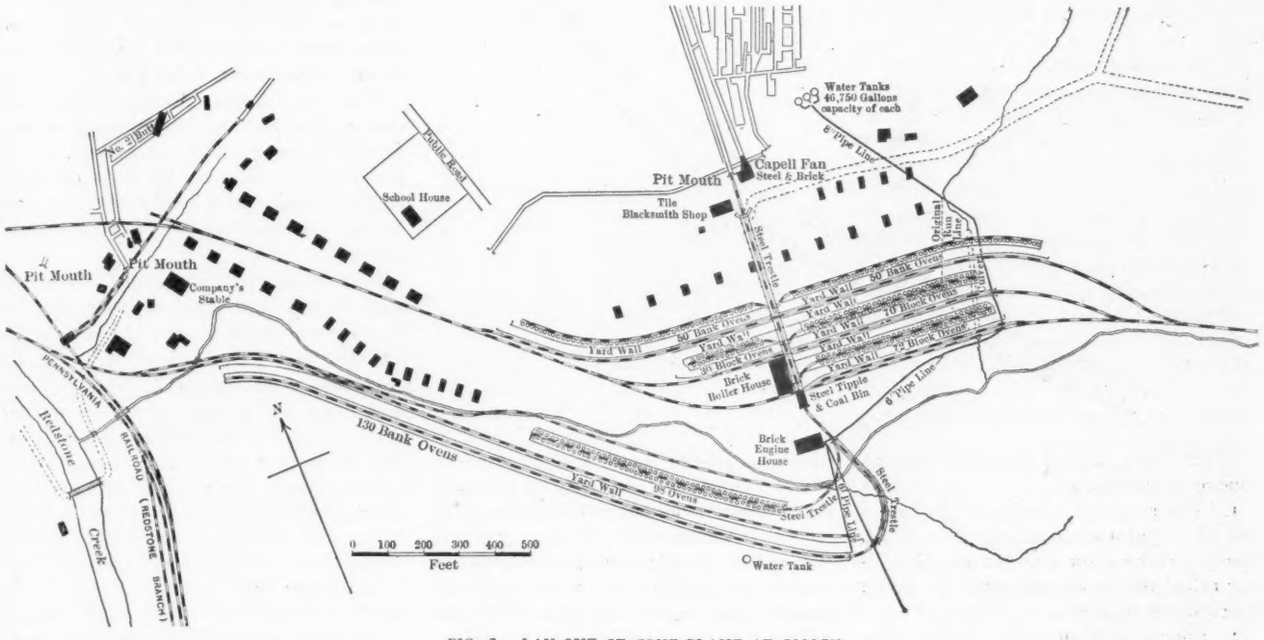

FIG. 3. LAY-OUT OF COKE-PLANT AT SMOCK.

Since 1889 when the Wallaroo mines, with their smelting works, and Moonta mines became one concern, copper worth about £4,281,342 has been produced, of which £224,000 has been distributed in dividends. In nearly 45 years these mines have raised and extracted about £12,245,554 worth of copper, and paid £1,822,254 as dividends.

At the smelting works, in addition to the high-class copper of the well-known "Wallaroo" brand, sulphuric acid and bluestone are manufactured.

Early in 1904 a fire in the main shaft at Wallaroo mines completely destroyed the upper portion, and rendered useless the pumping appliances to a depth of 2,000 ft. There was grave danger that the deep workings would be lost through the flux of water, but by strenuous exertions, and despite great difficulties, temporary pumping appliances were installed, driven by compressed air. These are now being supervised by an up-to-date electric scheme; also an extensive central steam power and compressed-air plant is nearing completion. A new shaft has been sunk 840 ft., to join the old one where the underlay passed to the vertical.

When the new surface and underground plant is completed Wallaroo mines should be re-established on modern and profitable lines, and as the deepest levels (1,800 ft. to 2,000 ft.) show no diminution in value as compared to those of less depth, the prospect of continued operations for years ahead is promising.

As further illustrating the operations at the mines, some additional statistics are appended, which, although not absolutely certified, are believed to be practically correct: Total dressed ore produced from the combined mines, 1860 to 1904, inclusive, 1,540,180 tons; average copper contents, 15½%; representing in fine copper, 235,630 tons; average yearly production of ore, 34,226 tons; maximum output in one year, 40,222 tons; total expenditure, £10,423,300; average annual expenditure, £231,629; average cost of each ton of dressed ore, £6 15s. 4d.; number of employees, June, 1905, 2,260; maximum number of employees, 2,600; total amount of dividends, £1,822,254.

The new regulations for the Colony of Victoria prescribe 70 cu. ft. per minute per head in every part of the mine, but the Minister of Mines is authorized to increase this in bad places up to 500 cu. ft. The criterion of ventilation is that the CO_2 shall not exceed 0.3% and the oxygen shall not fall below 20%.

Although many of the older natural-gas pools of Pennsylvania, which in former years were large producers, have now ceased to produce any considerable amount, there are other fields in which, by means of the suction lines leading to the gas-compressor plants, large areas of low-pressure gas are made available and have for many years been producing large amounts in the aggregate.

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* Abstract of a contribution in *Review of Mining Operations in South Australia* in 1905.

† General manager, Wallaroo & Moonta Mines, Ltd.

The Equipment of Incline-Shafts.*

BY F. N. HAMBLY.

The first problem that confronts the engineer in the exploitation of a vein is the class of shaft to be adopted and its location. In this contribution, I am assuming that it has been decided that the property is to be worked through inclined shafts. The mining regulations of the Transvaal require two independent outlets from any one mine. To make my deductions more clear, I will make the following assumptions:

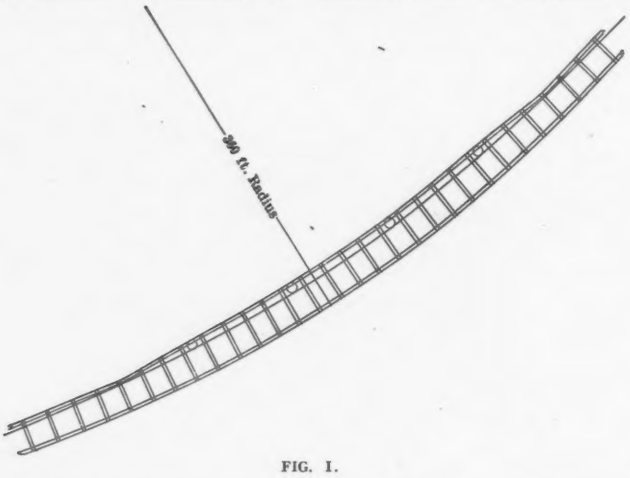

FIG. I.

1. The property is estimated to have a life of 10 years on a milling basis of 200 stamps crushing six tons per day, this being calculated as the minimum for a fair depreciation of plant.

2. Sorting 20% of the ore mined. The quantity to be mined per working day, allowing for 20% sorting, and a crushing capacity of six tons per stamp, and taking 26 working days per month, amounts therefore to 1,730 tons.

3. Two years' supply of ore to be developed before milling is started.

The first consideration is whether one of the shafts should be made large enough to do the whole of the mill-hoisting work, making the other correspondingly smaller and using it only as a traveling and airway, and for hoisting development rock; or, as an alternative, shall each of the shafts be made of equal size and be similarly equipped, each being capable of handling, say, two-thirds or all of the rock required for the mill? I consider the first of these propositions to be the best for the following reasons: (1) Less capital cost, and (2) less working cost, which statement appears so self-evident as not to require any further support.

The chief objection to a single hauling shaft is that in case of a breakdown, the whole mill may be hung up. With two hauling shafts, this possibility is, of course, practically annulled. If, however, great care is taken in the general equipment of the single hauling shaft, it is possible to reduce the chance of a breakdown to such an extent as to make it for all practical purposes negligible; hence the economic advantages both in first cost and subsequent working costs are not minimized. Involved in this argument, among many other points, are the following: (1) Size and grade of shaft; (2) headgear bins; (3) skips; (4) tracks; (5) ore-bins underground.

Features inimical to good work are the following: Bad arrangement of underground ore-bins; small size of ore-bins and the consequent necessity of changing continuously from bin to bin in the shaft, by which valuable time is lost; grizzleys too widely spaced; chutes and doors arranged in such a way as to make the speedy filling of skips an impossibility, as well as requiring more labor than is otherwise necessary; stopes blocked with ore while shovel and trammers stand idle, because the small shaft bins are unable to receive the ore; rails in the shaft both too light and badly laid; skips too small and badly designed for fast running. All these factors tend to inefficiency of labor, high maintenance costs and low efficiency from machinery.

I propose to make some arrangements to improve upon the unsatisfactory conditions outlined above.

1. *Size and Grade of Shaft.*—With a single hauling shaft, bearing in mind the amount of ore and waste rock to be raised in this particular proposition, together with the material, stores, etc., to be lowered, the following are the sizes and number of compartments I would suggest: Four hauling ways, one sinking way and one pump and ladder way of the following dimensions in the clear. Hauling and sinking ways 5 ft. 6 in. x 6 ft. Pump and ladder way 5ft. 6 in. x 7 ft. The traveling and air shaft to be sunk in connection with the main hauling shaft would be a small three compartment shaft, the size of the compartments being 4 ft. 6 in. x 5 ft.

With two hauling shafts, each should contain four apartments, consisting of two hauling ways, one sinking way, and a pump and ladder way, the sizes of these various compartments being the same as in the main hauling way in the first proposition.

With regard to the grade at which the shaft is sunk, it is usual to follow the dip of the vein. This practice is frequently attended with a considerable difficulty, in some cases made impossible, by variations in the dip, or faulting of the vein. In many instances, one or two prospecting bore-holes (put down from the surface) would indicate the position of the vein sufficiently to enable the shaft to be carried down at an even grade, and the amount of cross-cutting reduced to a minimum. Fig. 1 illustrates two conditions, in each of which a considerable amount of money would have been saved if boring had first been carried out before shaft sinking had been done. In the case of an incline-shaft, which is found necessary to alter to a flatter angle to conform to the dip of the formation, I have found that if the width of the shaft be slightly increased in that portion of the shaft occupied by the curve employed in reducing the angle of inclination, the fixing and maintenance of the rope carrying rollers is very much simpli-

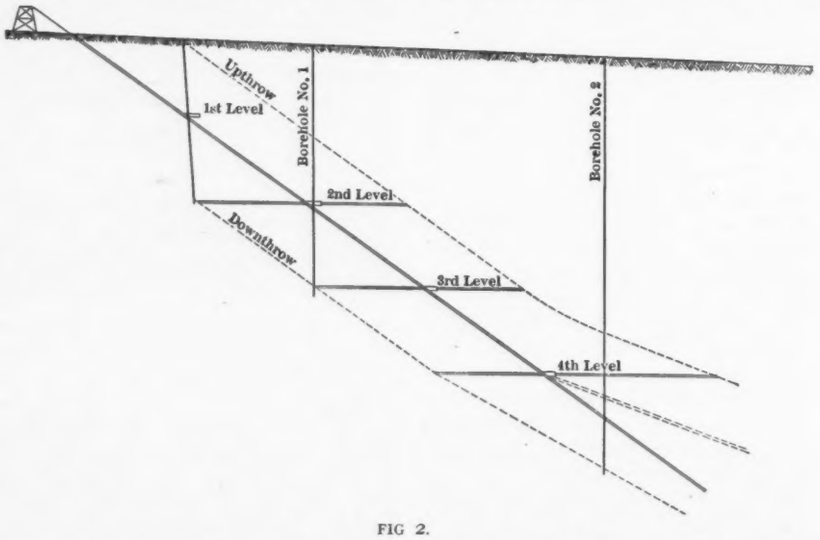

FIG 2.

*Abstract of a paper in the *Journal of the South African Association of Engineers*, Oct., 1905.

fied, and comparatively large diameter rollers can be put in. Fig. 2 shows this arrangement as fixed in the New Goch incline-shaft.

The radius of the curve should be designed to allow the skips to be hoisted through it at the maximum speed for which the shaft equipment is designed. Any diminution of the speed of the skips which would be necessary if the radius were too small wears out the rope on the headgear pulleys and the brakes on the hoisting engine, in addition to the loss of time involved.

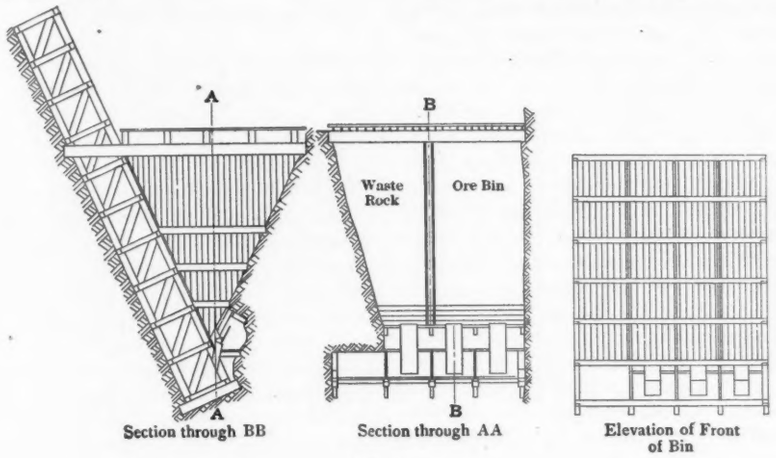

FIG. 3.

2. *Headgear Bins.*—With a single shaft the principal point to be studied is the storage capacity. Where 1,730 tons of ore, in addition to waste rock, has to pass the headgear bins daily, their capacity should be equal to at least one-third of this amount, in order to give a stand-by should anything go wrong during the day with the surface transport arrangements. It is usual to provide some tipping arrangement in the headgear just above the collar of the shaft, by which drills can be dumped out of the skips at surface. If this arrangement is fitted to all the tracks, it can be brought into use when water is hoisted, and the water dumped at a point from which it can be readily taken away. There is a strong objection to dumping water into the headgear bins, more particularly if the headgear is a wooden structure.

3. *Skips.*—The size and design of skips when combined with the capacity of ore bins and the condition of the track, bears a very important part in the economy of hoisting. For the shaft specified I should put in a skip of sufficient capacity to hold six tons of broken rock, and hauling engines capable of lifting these skips unbalanced from the ultimate depth of the shaft and to attain a speed of 2,500 ft. per minute. These skips should be designed with the object of providing for smooth running at the speed above indicated. If reliable self-lubricating bearings are put in, it is quite possible to run this size of skip up to a speed of 2,500 ft. per minute with 15 in. wheels, without the maintenance cost being unduly high. In the case of a breakdown of the pumping arrangements, involving the necessity of hauling water, each of the skips should be provided with a clack, and arrangements made for dumping water on surface clear of the headgear. At the New Goch mine the pump sumps are connected at their lowest point with a crosscut from the shaft. A pipe is laid through the crosscut from the bottom of the sump, and a hose arrangement fixed, whereby the water in the sump can be run directly into any of the skips. This is a useful arrangement when the necessity of cleaning out the sumps occurs.

4. *Tracks.*—To hoist a skip containing six tons of ore at a speed of 2,500 ft. per minute, the rails must be of heavy section, and great care taken in laying them down. The weight of the rails should be at least 65 lb. per yd., and I do not consider 80 lb. too heavy. These should be fixed to the sills by coach screws through the flanges in addition to the usual dog-spikes. At the New Goch incline shaft, 80-lb. rails have been installed and fixed in the above manner. The joints on either side of the track do not come opposite each other, and the ends of the rails are brought so closely together as to be almost touching. The inevitable space between the sills and the footwall rock of the shaft has been filled solid with concrete. With the sills spaced at about 5 ft., a track is obtained over which the maximum speed can be attained with great safety.

The ballasting of the sills with the concrete serves as a drain by which any water making in the shaft can be led, at the point of inflow to the shaft, directly to the pump way, thus preventing to a large degree acid water coming into contact with the rails and winding ropes.

5. *Underground Ore-Bins.*—The points to be observed in laying out the underground ore-bins are (*a*) capacity, (*b*) division, (*c*) grizzleys, (*d*) discharge chutes and doors, and (*e*) type and cost.

(a) Capacity.—The capacity of an ore-bin should bear a definite relation to the milling capacity and the length of the backs underground. In the proposition I have indicated, by the time two years' supply of ore will be in sight, assuming backs of 250 ft., four levels will be opened up, and the ore-bin equipment completed. Each of these four ore-bins will therefore be called on to hold at least one-fourth of a day's supply of ore for the mill, which would equal, say, 450 tons. In addition to this ore capacity, each bin should be also arranged to hold about 100 tons of waste, making the total capacity of the bin 550 tons. With 450 tons of ore in each box and six-ton skips, averaging 25 trips per hour—which allows ample time for filling, hoisting and tipping—the two hoisting engines can easily handle the 1,730 tons required daily for the mill, working on an average of six hours per day. To enable the whole of this ore to be put into the mill during the day shift only, this would probably be the method adopted, and the ore-bins would necessarily have to be of ample capacity to hold a sufficient reserve of ore trammed during the night shift to enable steady and continuous running being made when the hoisting engines start work. With 200 tons in each of the four bins when hoisting is started, it would probably not be necessary for either engine to change from one bin to the other more than three times in each shift.

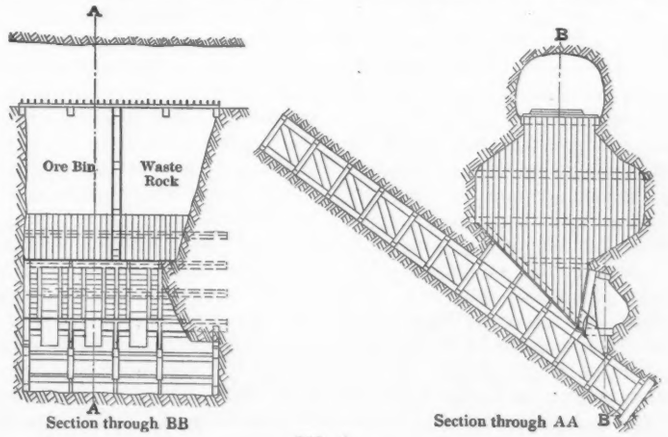

FIG. 4

(*b*) Division.—Each bin should be divided into two unequal compartments. The small compartment, situated over the

sinking way, should be designed to hold about 100 tons. This would hold the waste rock from about 50 ft. of driving, and should allow storage room for the rock from four days' development work on 10 faces. To illustrate the importance of making provision for keeping waste rock and unpayable ore separate from payable ore underground by the provision of waste and ore compartments in the ore-bins, I have figured that during the development period when the two years' supply of ore for the mill is being opened, assuming that the development is being carried on two veins, the average stope width of which will be 50 in., that 70% of the ore is payable, and that through faulting 30% of the driving is off the vein, the total footage driven will be 25,391, of which 7,617 will be off the vein. The actual tonnage broken in the drives will be roughly 51,000, of which a little more than half, say 26,000 tons, will consist of waste and unpayable ore. If this waste and unpayable ore is dumped into the same bin with the payable ore, the probabilities are that if this is subsequently put through the mill, a considerable difference will be shown in the profit obtained compared to that if the payable ore had been kept separate from the waste. To illustrate this, I will assume that the payable ore is valued at 6 dwt. and the waste and unpayable ore at 1 dwt., and that the breaking and hoisting of this rock being already charged to development, reduction costs only will be charged against the revenue obtained from it. The total of 51,000 tons put through the reduction works would yield a recovery of about $2.88, at a cost of, say, $1.92, leaving a profit of, say, 96c. per ton, equal to $48,960. The 25,000 payable tons at 6 dwt. would have under the same conditions a recovery value of $4.80, which, at the same cost of $1.92, would leave a profit of $2.88 per ton or a possible profit of $72,000. By the provision of waste compartments in the underground bins—the cost of which figures out at about $240 on each bin—it would on the above showing enable the company to make an additional profit on the development rock of nearly $23,000. During the milling stage, with the same conditions as I have assumed, *i. e.*, if the waste and unpayable ore from the development faces is kept separate from the payable ore and sent direct to the dump, and it is assumed that the yearly tonnage developed is equal to that milled, an additional profit of roughly $11,520 a year will be shown, and 13,000 additional tons of ore from the stopes can be put through the mill, each of which should show a profit to the company as against a loss if the waste had to be put through. I have not considered in the above calculations the possibility of discarding a large proportion of this waste on the sorting table, should no provision be made underground as I have indicated. The benefit that would accrue to the discarding of this waste on the sorting table will be more than balanced by the increased difficulty of sorting the waste contained in the ore from the stopes by the presence of the waste rock from development being mixed with it.

(*c*) Grizzleys.—The gauge to which the grizzleys are set is an important point, and one which considerably affects the speed at which the skips can be filled, and also the life of the chutes and discharge doors. I have found that a setting to admit only 6 in. cubes passing through into the ore bins is best. With ample grizzley area for the bins, which would be obtained in the size of the bins I have indicated above, very little trouble is experienced by choking. The grizzleys should be made stiff enough to stand large pieces of ore being broken up on them; 30 lb. rails I have found none too heavy. The suggestion made some time ago by Mr. G. A. Denny in his paper on "Underground belt conveying," to put rock-breakers on the underground stations over the ore-bins, is one which possesses a great attraction for me, as with such an arrangement grizzleys could be done away with in the headgear, and a large number of boys who are continually employed in breaking up the rock on the stations would be employed to better advantage elsewhere in the mine.

(*d*) Discharge Chutes and Doors.—The angle at which the chutes in an ore-bin are set, and the ease with which the doors can be operated, affect very largely the hoisting capacity of an engine. I have tried various designs, and find the ones indicated in Fig. 3 and 4 much the best. In this arrangement, the chutes are set at an angle of 45° and look down the shaft. The skipman who is operating the doors is clear of the shaft, and is free from the danger which always attends when the doors are so arranged as to be operated from the shaft itself.

(*e*) Type and Cost.—In Figs. 3 and 4 I have indicated two types of ore-bins. In Fig. 3, the whole of the rock is cut out of the hanging wall of the shaft, and the station and ore-bin put in entirely with timber. In Fig. 4, the station is cut independently of the bin, and the ore-bin is of the type known as a rock box. These bins are of about the same capacity, and are designed for a four-compartment shaft only. The objections to the bin in Fig. 3 are (1) that, being carried entirely on the shaft timbers, the whole bin is apt to be knocked out should the skip come off the rails and catch the timbers; (2) should the timbers be weakened by rot, there is a danger of the box collapsing into the shaft. With regard to the first objection, the possibility of the skip coming off the rails, if the tracks are laid down and the chutes ranged from the ore-bins, as I have indicated, is a very remote one, and needs hardly be taken into consideration. As regards the second objection, if the main hauling way is arranged so that it shall be a downcast shaft, and the timbers are creosoted or thoroughly saturated with a wood-preserving solution, a life of ten years, which is the basis I have assumed for the life of the mine, is not too much to expect for the box. The cost of the box shown in Fig. 3 is considerably less than that shown in Fig. 4, being for the sizes indicated in the sketches at least $1,400 cheaper to put in and can be completed in a much shorter time.

Natural Gas Wells.*

BY F. H. OLIPHANT.

There were 16,138 wells producing natural gas in the United States at the close of 1904. These vary greatly in depth and production. Some of the more shallow wells are only 250 ft. in depth, while the deep sand wells in southwestern Pennsylvania and in West Virginia are in many instances over 3,000 ft. in depth.

There are a great number of shallow wells in northwestern New York, northern Pennsylvania, and northeastern Ohio, which secure sufficient natural gas from the Devonian black slate to supply a single house with light and heat; the smallest of these have a capacity of about 1,000 cu. ft. per day. Some of the powerful wells of West Virginia, southwestern Pennsylvania, and Kansas have produced as much as 35,000,000 cu. ft. in twenty-four hours. There are numerous 10,000,000 cubic feet wells in the new Knox county field in central Ohio. The very shallow wells are generally only 2 to 3½ in. in diameter. The deep gas wells start with an 8 to 10 in. hole, and finish with a hole 5⅝ or 6¼ in. in diameter. A wooden conductor is set on solid material, or if a mass of quicksand or gravel is first encountered an 8 or 10 in. drive pipe is forced to solid material by drilling and bailing inside and driving the pipe down at intervals.

The starting of an ordinary gas well with a size larger than that with which it is finished is owing to the necessity of cutting off flows of water, which are invariably encountered in some of the upper rocks before the gas reservoir is reached. It is the usual practice to drill past the inflow of salt or fresh water into the underlying shale or slate.

Experiments made by K. Angstrom upon 100 mg. of unusually pure radium bromide, show that 1 gm. of radium bromide gives out 1.14 calories per minute, or 68.5 cal. per hour, so that 1 gm. of pure radium would give (taking the atomic weight of radium as 225) 117 cal. per hour—or 110 cal. for atomic weight 258. These values are some what higher than those obtained by Precht. In seven months the radium gave off altogether 345,000 cal. per gram.

*From Mineral Resources of the United States for 1904.

The Palmerton Works of the New Jersey Zinc Company.*

BY O. PUFAHL.

These works are situated very favorably in the coal-field of the Lehigh Valley, Pennsylvania. They comprise a large zinc-white factory, a spiegeleisen blast furnace, a zinc smeltery, lithopone works, and a sulphuric acid factory working by the Grillo-Schroeder contact-process. The plant is well designed and well constructed. About 1,000 men are employed in all the departments.

The zinc ore comes from Franklin Furnace, N. J., after having been prepared there by the Wetherill process. In the zinc smeltery, willemite with 47 to 48% Zn is worked up. The raw material for the zinc-white works is an intimate mixture of franklinite and willemite (but chiefly franklinite), containing on an average 23% ZnO. The residues from this process are smelted for spiegeleisen in the blast furnace.

Oxide Works.—The furnace house of the oxide works is built entirely of iron. It is 1,500 ft. long and 50 ft. broad, and contains 480 kilns built in 30 blocks, each with eight furnaces on either side. The daily production of zinc white is 700 bbl. of 300 lb. each, or 105 tons. Unlike the arrangement at the older works (at Bethlehem, Newark and Jersey City), the working level is 10 ft. above the ground level, so that the kiln-residues can be tipped into boxes, from which they are then readily transferred to cars, which convey them to the blast furnace. All the blowers for the under-grate blast and for forcing on the gases charged with zinc oxide, are driven by electricity.

The cotton bags in the immense filter-house are 60 ft. long. The zinc oxide is mechanically filled into the barrels, the loose sifted material being pressed in by a mechanism. Average samples are taken and after grinding them up with unboiled linseed oil, are tested in the laboratory upon porcelain plates for their color and quality.

At the time of my visit the zinc oxide works were in the course of enlargement, which was to raise their daily production to 800 barrels.

Spiegeleisen Blast Furnace.—The residues from the zinc-white manufacture are smelted in a blast furnace 60 ft. in height and provided with electric charging mechanism. In making up the charge an ample allowance of limestone and anthracite and a small quantity of coke are added, and this is then smelted for spiegeleisen with 10 to 21% Mn and 0.03% P. The slag contains about 6% Mn. The 50 long tons produced daily are sent to the Lackawanna Steel Works, Buffalo, N. Y. In the purification of the waste gases impure oxides containing 47% Zn are recovered, which are added to the charge in the zinc smeltery. The purified waste gases are used for heating the U-pipe, hot-blast stove (blast at 500° C. is used), and for firing boilers. Three more similar blast furnaces are to be built.

Spelter Works.—The smeltery contains two Siemens furnaces with 256 retorts of 7x9 in. internal diameter and 46 in. length, arranged in three rows. The charge per retort consists of 37 lb. of willemite (containing 47 to 48% Zn) and 55% of anthracite as reducing coal. The retorts are made by hydraulic press, the mix being prepared from St. Louis clay and crushed old material. The condensers are 18 in. long. Iron prolongs are used.

There are also two Convers & de Saulles furnaces, each having 160 retorts of the same size as those in the Siemens furnaces.

The furnaces are fired with gas made in 12 Dowson producers, each 8 ft. in diameter, in which anthracite (buckwheat size) is used, each producer gasifying consuming four long tons per 24 hours. The gas contains on an average about 8% CO_2, 26% CO, 19% H and 3% H_2O.

The zinc is drawn into a ladle carried by a travelling furnace shield (Chapman's patent). The retort residues are blown out with steam, and drop into pockets below the furnaces, when they are removed in cars. They assay about 5% Zn.

The spelter is purified simply by skimming, and is then cast into plates of about 43 lb. (Horsehead brand). It is of very high grade, the only impurities being about 0.015 to 0.02% Pb and a similar percentage of iron.

The life of the retorts is only 28 to 30 days, owing to the high percentage of iron and manganese in the ore, which corrode them badly.

The smeltery is being enlarged by the addition of eight furnaces with 200 muffles each.

The Lithopone Works.—There is at Palmerton a small plant for the production of lithopone, which material is used as a color, possessing good covering power, and also in the manufacture of oil-cloth, linoleum and rubber tires.

The requisite solution of zinc sulphate is obtained by treating waste metallic zinc of any kind with sulphuric acid, and is freed from iron and manganese by means of chloride of lime, and subsequently, after filtering in a press, the copper, nickel, cobalt and cadmium are removed by boiling with zinc dust. Barium sulphide is prepared by calcining heavy spar (imported from Germany) with coal in a revolving furnace; the product is systematically leached with water. The two liquors are mixed in large wooden vats with stirrers, so as to precipitate the white pigment consisting of a mixture of zinc sulphide and barium sulphate. This precipitate is collected and washed in a filter press, is dried upon steam-heated racks, calcined in muffles and is quenched at red heat in water. The material is then ground while moist, washed, collected in a filter press, dried, broken up in disintegrators, and ground to a flour.

This rather complicated method of preparation adds considerably to the cost of production. Lithopone is stated to be unsuitable for a covering for metals, as it blisters after some time, and ultimately scales off. A remedy for this trouble has been much sought, but so far in vain.

Sulphuric Acid Works.—The small sulphuric acid factory is worked principally to exhibit the Grillo-Schroeder process, the American patent for which is owned by the New Jersey Zinc Co. Pyrites fines are roasted down to 5% S in a five-hearth O'Brien furnace. The gases are very carefully purified. From the dust chamber they pass through vertical iron pipes, where they are cooled, and through a dry coke tower; thence through scrubbers down which sulphuric acid of 60° B. is trickling, and finally through dry asbestos filters, consisting of a large number of thin layers of asbestos laid upon perforated leaden sheets.

The purified gas is raised to the temperature of reaction (500° C.) in vertical cast-iron pipes heated with coal, and then enters the contact apparatus. The anhydride is absorbed in sulphuric acid of 60° B.

*Translated from *Zeit. f. Berg-Hutten und Salinenwesen im Preuss. Staate*, 1905, LIII., 400.

The Hancock Jig.

Mr. Geo. H. Robinson, managing director of the Britannia Copper Syndicate, Ltd., Vancouver, B. C., has made the following statement as to the Hancock jig installed at that property: The material passes over the jig after passing through the various crushing rolls and is reduced, by which all of the slime and very fine mineral, finer than 40-mesh, is extracted. The balance of the material is sent over the jig. Of all the concentrates recovered from our ore I think I am safe in saying 70% comes from the jig. No. 1, 2, 3 and 4 compartments make mineral; No. 5 is returned to the re-crushing rolls; No. 6 is sent to the grinders; No. 7 is a comparatively rich slime that is sent to the vanners. We have not had the slightest difficulty in operating the jig. It requires the attention of one man and about 5 h. p. Its capacity is something over 500 tons. The concentrates are higher grade than table concentrates."

Investigations are to be conducted by the Mines Department of the Federated Malay States into the question of waste in Chinese tin mining, and for this purpose a sum of $5,000 has been provided.

Palladium is somewhat lower in melting point than platinum, and fuses at about the temperature of wrought iron.

Coal-Dust Firing of Reverberatory Matte Furnaces.

BY S. SEVERIN SÖRENSEN.*

The following notes are from some experiments made at the Highland Boy smelter, at Murray, Utah. The objects which induced the company to try coal dust firing for reverberatories can be explained by stating the prevailing conditions then obtaining at the plant.

The furnaces were 38 ft. by 15 ft., and 43 ft. 6 in. by 15 ft., internal dimensions varying anywhere between two and six hours.

It will be readily understood that in such long periods, during which the fire on the grates was only stirred from the top prior to having fresh coal dropped on it, the clinkers would become very hard and massive. After forming close to the grate-bars at first and slagging together on the brick walls of the fire-box, they gradually chilled and hardened from the bottom up. It became a heavy and arduous piece of work to break them up, get them out and put the fire on the grates again in proper condition for another smelt. This process of grating took from one-half to two hours, and during that time the furnace was practically idle. The natural draft of the chimney was not enough to maintain the heat, and we were, therefore, losing ground. The accompanying temperature diagram, Fig. 1, shows clearly the effect of grating.

Moreover, in grating the operation of getting out clinkers unavoidably entails the dropping of a large percentage of live and even at times scarcely ignited coal. As there is no washery at this plant to recover unburned coal, it is an item of loss.

Another source of small but frequent loss is in incomplete combustion due to want of skill or attention in firing, evidences of which are a smoky flame in the furnace or a roaring flame in the stack. The latter, it is true, may not be incomplete combustion, but it is complete combustion too late and in the wrong place.

A secondary, but by no means unimportant resultant drawback from these long spells of idleness when grating, is the injurious effect on the roof of the furnace. The skimmer is required at the grates and the roof has to look after itself. The consequent expansions and contractions do not tend to prolong the life of the roof. Silica tends to "gather" by freezing during the grating spells, requiring longer firing to flux and resmelt. All these and other considerations made out a good *a priori* case in favor of trying pulverized coal, for the following reasons: (1) The action is continuous; there are no stops for grating. (2) The heat generated is uniform and steady. (3) Combustion is complete at all times. (4) Combustion is rapid and concentrated and therefore productive of high temperature. The complete combustion takes place in the laboratory over the

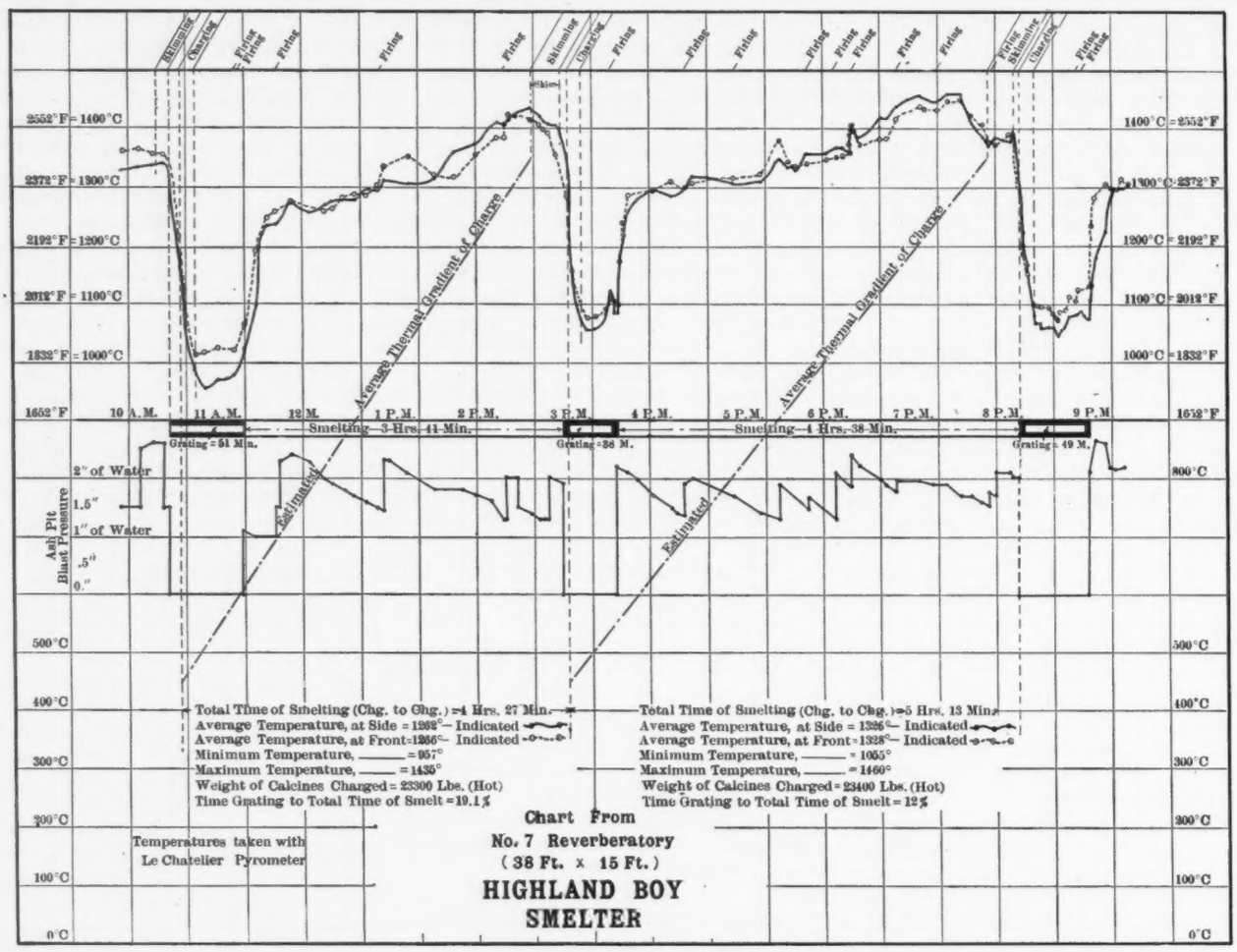
Skimming
Charging
Firing
Average Thermal Gradient of Charge
Grating = 51 Min.
Smelting—3 Hrs. 41 Min.
Grating = 36 M.
Smelting—4 Hrs. 38 Min.
Grating = 49 M.
Estimated
Ash Pit Blast Pressure
2" of Water
1.5"
1" of Water
.5"
0."
Total Time of Smelting (Chg. to Chg.) = 4 Hrs. 27 Min.
Average Temperature, at Side = 1262°— Indicated
Average Temperature, at Front = 1266°— Indicated
Minimum Temperature, ——— = 957°
Maximum Temperature, ——— = 1435°
Weight of Calcines Charged = 23300 Lbs. (Hot)
Time Grating to Total Time of Smelt = 19.1%
Total Time of Smelting (Chg. to Chg.) = 5 Hrs. 13 Min.
Average Temperature, at Side = 1326°— Indicated
Average Temperature, at Front = 1328°— Indicated
Minimum Temperature, ——— = 1055°
Maximum Temperature, ——— = 1460°
Weight of Calcines Charged = 23400 Lbs. (Hot)
Time Grating to Total Time of Smelt = 12%
Temperatures taken with Le Chatelier Pyrometer
Chart From
No. 7 Reverberatory
(38 Ft. x 15 Ft.)
HIGHLAND BOY
SMELTER

FIG. 1. DIAGRAM OF SMELTING RESULTS.

of hearth. Each had its own independent stack 80 ft. high. The fire-boxes were 5 ft. by 8 ft., and 7 ft. 6 in. by 8 ft., and carried a bed of coal on the grates about 3 ft. deep. They worked with closed ash-pits and were supplied with forced draft under the grate-bars; this was produced by independent blower-fans, electrically driven. This arrangement necessitated intermittent grating which was done generally just after skimming and when charging up, or, occasionally, only after every other skimming. The intervals between grating were long and variable, depending on the nature of the charge and the working of the furnace,

*Engineer, Utah Consolidated Mining Co., Murray, Utah.

hearth, where the heat is wanted, and little or none in the fire-box.

An opportunity to put this to the test was given by the Aero Pulverizer Co. of New York, which provided one of its machines for the purpose. This is a centrifugal impact pulverizer with three sets of paddle blades at the end of arms mounted on spiders on a common shaft. Each set is of different diameter and revolves in a chamber of corresponding diameter. The feed hopper and mechanism are at one end, are variable and under control. At the opposite end a fan is mounted on the same shaft. Its suction is primarily through the crushing chambers back to an aperture, with a register close to the feeder. But it also has an auxiliary opening fitted with a register to admit air directly to the fan inlet, without passing through the pulverizing chambers. The draft of air through the machine and by absorbing heat in the generation and dissociation of the steam due to the moisture.

The coal dust was blown into the furnace through a single flattened nozzle, flaring sideways, whose aperature was 1½ by 24 in. The general arrangement is shown in Figs. 2 and 3. The front of this nozzle was placed 30 in. back of the bridge-wall, which allowed of a small fire-box between the bridges and the nozzle wall, sufficient to carry a fire for raising heat to the point at which the coal-dust flame could maintain its ignition temperature. After this had once been attained there was no difficulty in restarting, after stopping for charging or for other causes. The incandescent brick work at once ignited the dust even in the presence of the coal calcines charged. We were burning from 20 to 30 tons of coal per diem; for one month We also had a water coal around the first nozzle and a water jacket on the second. The temperature around the nozzle was therefore kept below the ignition temperature, and explosive flame did not apparently travel back through it.

As to the second anticipated difficulty, the ash dust did at times settle on the charge, but it was never enough to cause any appreciable insulating or blanketing of the charge; it did, however, gather a little in the flue and stack but it was easily barred off.

That the flame was long enough to reach the front of the furnace was soon proven by its ability, when allowed to do so, to "hit" and smelt the stack.

The troubles which we met with were those chiefly due to the experimental nature of the run, such as excessive moisture in coal, causing both inefficient combustion and stoppage due to clogging;

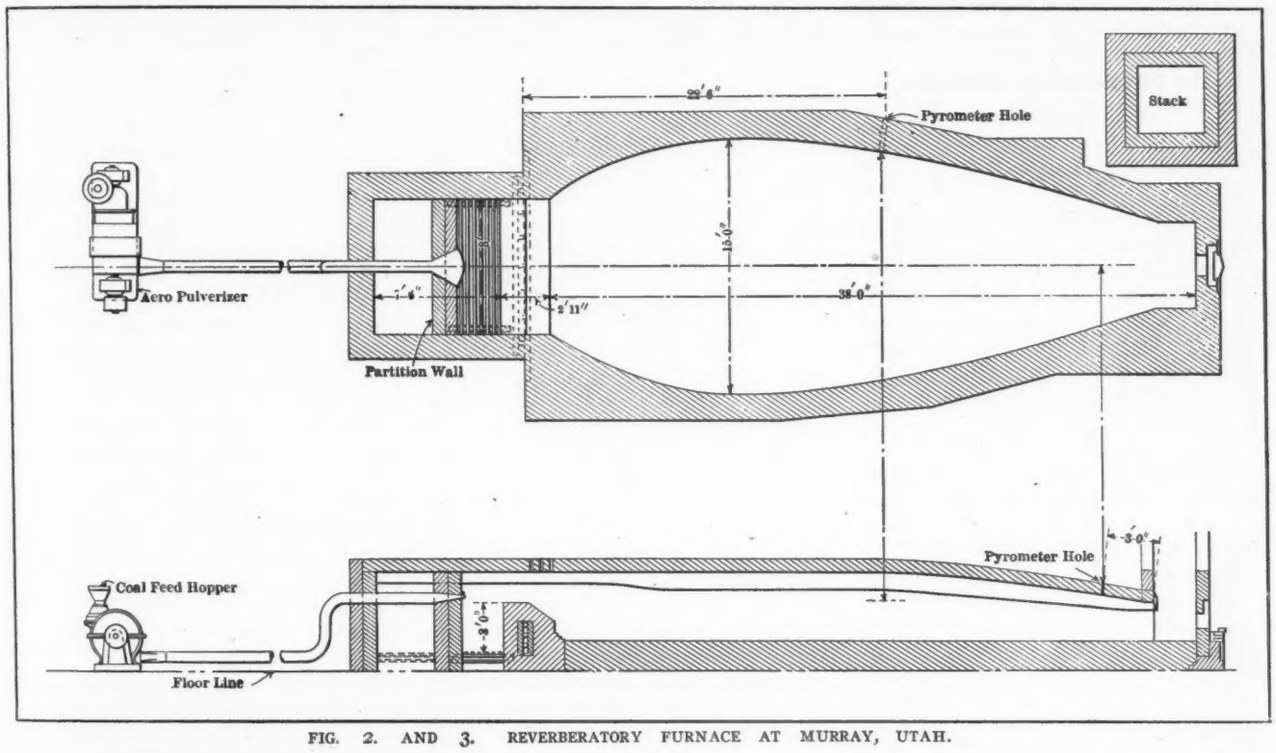

FIG. 2. AND 3. REVERBERATORY FURNACE AT MURRAY, UTAH.

latter carries the powdered coal with it, the quantity and therefore the velocity of such air regulating the fineness of the coal dust. The machine was run at about 1,400 r. p. m.

The dust produced was an impalpably fine flour, 90% passing through a 150 mesh sieve. One of its chief advantages, especially for such experimental work as it had to do in this case, was in its being a compact self-contained unit; it was further recommended as being able to handle coal without its having been dried. It did, as a fact, at times handle coal running as high as 10% in moisture due to snow in bins and cars, which was unavoidable under the circumstances. Of course it lowered the efficiency, both by reducing the crushing capacity of the it averaged 22.8, for the next 27.17 tons daily. With this quantity we found the air supply from the size of pulverizer we had was too small and it was supplemented with an additional supply from the forced draft fan outfit. The best results were obtained with an excess of air; the oxidizing effect of such a flame was no drawback to the smelting process, it tending merely toward producing a higher grade of matte.

Before beginning the experiments we anticipated trouble from two causes: (1) Possible explosions and (2) ash from the burnt coal dust. Neither proved of any importance. We guarded against the former by shutting off the coal feed before stopping the pulverizer so that the blast cleared the pipe and nozzle of dust. having to use lump coal which threw extra work on the pulverizer and caused frequent stoppages from choking the chutes and feed; and mechanical troubles due to the machine being rather overloaded.

Notwithstanding these drawbacks the result for two complete months' running showed that the coal-dust fired furnace (which was one of the smaller size) smelted 30% more calcines than the average of the others, and used 24% less coal per ton of calcines smelted. This was exclusive of the coal equivalent of the power required to drive the pulverizer. The latter varied between 20 and 40 electrical horse power, or (say) 30 to 60 i. h. p. Adding the coal required for generating this power to that used for

coal dust firing, the latter still showed a saving of from 15 to 20% over the other furnaces. In cases where steam is gathered from the waste heat from the reverberatories this deduction for power coal need not be made. There was also a saving in labor as the graters were not required and no extra attendance was necessary for the pulverizer.

These results were considered satisfactory and a plant was discussed for applying this system of firing to all the furnaces. At that time, however, other improvements were introduced in the construction and working of the reverberatories which, together with the difficulties of applying a general system of coal-dust firing to the existing plant, caused the system to be dropped. It is, however, certain from the tests we made that this method of firing is capable of very efficient results in reverberatory smelting in a plant properly laid out and equipped for the purpose.

The Physics of Ore Flotation.*

BY J. SWINBURNE AND G. RUDORF.

Concentration of sulphide ores by flotation was introduced by Potter in 1901. Since then other inventors have been at work in the same direction.

Concentration by flotation is carried out by treating the crushed ore with a suitable solution, such as a strong solution of acid sodium sulphate, at a suitable temperature, which is near the boiling point of water. Part of the ore then rises to the top, and is skimmed off, or otherwise separated, and this forms the concentrate.

The explanation generally given is that the acid liberates hydrogen sulphide from the sulphides, and the gas then sticks to the particles and carries them up. As the acid does not act on the gangue, which in such cases is largely silicious material, the gangue is not carried up; and thus the separation takes place.

This explanation does not fit the facts. The sulphides generally treated are not attacked by the acid solution, so that there is no hydrogen sulphide evolved; or, at most, it is given off in very small quantities, which are out of all proportion to the amount of material floated. The sulphides of zinc, iron and manganese alone are attacked by dilute acids. It cannot, therefore, be the hydrogen sulphide that carries up the particles of sulphide. There is, indeed, a considerable evolution of gas, but it is carbon dioxide, and carbon dioxide is chiefly given off by the gangue, which generally contains calcite and other carbonates, the carbonates being mostly produced by the weathering of the sulphide particles. According to the theory just given, this action, contrary to what is actually found to be the case, ought to float up either the gangue as a whole, leaving the sulphides, or it should at least float up the carbonates. In most cases flotation does not take place at all until the temperature approaches boiling point.

It seems probable that the whole matter is mainly a question of capillarity, or rather of adhesion and surface tension effects, and although other theories have been put forward, we think that this, besides being very simple, explains the facts best.

We will consider the case of a particle of ore and a gas bell. The surface tension of the liquid tends to make the surface of the liquid as small as possible consistently with its still containing the air. If the particle has adhesion the surface of the liquid surrounding it must be considered as part of the surface which has surface tension, so that the surface will arrange itself in such a way as to be the least possible to include both the gas and the particle. If the particle is large in proportion to the gas bubble the surface will surround it, the gas filling up any inequalities and helping to allow the surface to take the spherical form. If the particle is small the result will be a gas bell with a particle nearly inside it. Imagine now the particle to be endowed with increasing adhesion. It will first attach itself to the liquid at one or more points, and the angle of contact will become more and more obtuse. As this takes place the particle gets more and more into the liquid and out of the gas bell, until the gas bell is sticking to one side of it. If the adhesion increases more and more the final stage is that the bell has become a sphere which just touches the particle at one point. The bell will then leave the particle. In any intermediate case, such, for instance, as a bell of gas "sticking" to the particle, the adhesion would tend to reduce the surface of the solid that is in contact with the gas, and thus to make the bell more nearly spherical. The surface tension, on the other hand, is tending to make the surface of the liquid, including that in contact with the solid, as small as possible, consistently with its containing the gas.

In order to make particles of ore float up it is, therefore, necessary to get adhering gas bells, and to get these to "stick" the surface tension and adhesion must be properly related. The term "stick" is not, of course, really applicable. The particle does not stick to the air bell. We are accustomed to think of an air bell as if it were something independent of the liquid, floating about in it, forgetting that its attachment to a solid is a question of capillary and surface phenomena, but for simplicity we may talk of the bell sticking to the solid.

Most constituents of ores have too great adhesion for water or dilute acid to be easily floated. To make it possible to separate them, it is necessary either to diminish the adhesion or to increase the surface tension of the liquid. If the particles are sufficiently small for bells to raise them, the only conditions necessary are that the bell should be formed, and that the adhesion and surface tension should be rightly proportioned. Surface tension alters with temperature. The surface tension of water falls with rise of temperature, until it reaches zero at the critical temperature. As far as surface tension is concerned, therefore, the higher the temperature the less chance of success. But the adhesion is a different question. It varies considerably in different substances. Those with least adherence are generally called "greasy." The strange thing is, however, that bodies like stibnite, which have small adhesion for water and thus resemble grease, have apparently a greater adhesion for grease, and can therefore be separated by oil according to Elmore's method.

The various sulphides have different adhesions. The gangue, as a rule, has very great adhesion, and cannot be floated. Even such bodies as stibnite, unless very finely ground, have too much adhesion to be floated at ordinary temperatures. The adhesion is altered enormously with change of temperature, however. Many of the sulphides, such as galena, stibnite, and molybdenite, have their adhesion reduced enough to be floated easily near the temperature of boiling water, and though the surface tension is also reduced with increase of temperature, the adhesion is reduced much more quickly. The surface tension becomes zero at the critical temperature; the adhesion probably falls to a very low value at the boiling point.

In order to get concentration by floatation, it is necessary to have an ore whose valuable constituent is some "greasy" sulphide, such as galena, or at most so automatically attached to the greasy sulphide that it come off with it. Zinc sulphide is thus easily raised by galena when intimately associated, as in the Broken Hill and some of the Vieille Montagne Company's ores.

It is not enough to have the greasy particles; it is necessary to produce the gas bells and get them against the particles. In practical work the only gas that comes off is carbon dioxide, and this appears to come largely from calcite. But mixing calcite with an ore which has a greasy constituent will not necessarily float it; the gas is apt to come from the particles of calcite without getting attached to the ore. It seems much more likely that the gas that really effects the floatation is generated by the action of acid on small quantities of carbonates produced by a slight weathering of the ores. It is most likely due to small amounts of carbonate of iron and manganese. These carbonates are also not attacked by dilute acid in the cold.

But there is another consideration. The questions of adhesion, and of formation of adherent gas bells, are intimately connected with the air-film.

*Abstract of a paper read before the Faraday Society, Dec. 12, 1905.

A way of demonstrating the presence of gaseous envelope is to sift some powdered substance which easily sinks, such as sand or ferrous sulphides, upon the surface of hot water, previously freed from gas by boiling. Bubbles of gas rise from the surface of the solid particles. Many observers have recorded the floating of perfectly dry sand on water. According to Simonds, the floating of the sand depends on the shape of the grains. Ladd notes the same conditions, and adds that the pieces must be sharply angular. Felspar and mica will also float under these conditions. Evans also found that pieces of slate 1.5 x 0.75 x 0.1 cm. float on tap-water, if perfectly dry.

The substances usually known as gangue are much more easily wetted than the metallic substances. Again, some are much more easily wetted than others. Thus, iron pyrites is easy to wet; that is to say, difficult to float, whereas antimony sulphide is difficult to wet, or easy to float.

A particle which is once wetted will never float, because even if a gas bubble were formed on or round it, it would not carry the solid up, as it falls through[1]. On the other hand, if a particle has still a very thin film on it, but this is insufficient to buoy it up, it is easily conceivable that by generating gas, such as CO_2, upon it, this gas will add itself to this small air-film and eventually raise the particle. Here, again, the temperature seems to be of importance, and this probably explains why a substance like ferrous carbonate, which is not attacked by dilute acid at a low temperature, is better than calcite or copper carbonate which are attacked in the cold.

To sum up, we suggest that the selective flotation is due to the presence of "greasy" sulphides, which have small adhesion, and that high temperature is necessary to reduce the adhesion enough for the bells of gas to stick. It seems necessary that the gas should be produced at the surface of the particles themselves; and it is, in fact, produced by the decomposition of carbonates due to slight weathering of the ore. If an ore that can be floated is treated with acetic acid to remove the traces of carbonate, it cannot then be floated again. The air-film also plays an important part; and if an ore is thoroughly washed or boiled in water to remove the air-film, it cannot be concentrated with acid. Some ores, such as stibnite and molybdenite, appear to have enough air on their surface to form a mixture of air and steam at a temperature below boiling point, which has enough volume to float the particles. Acid is therefore unnecessary in such cases.

Of the various ores and sulphides we have tried in dilute acid or acid sulphides of soda, the following are most easily floated, in order of merit:—Molybdenite; stibnite; galena; mixed zinc-lead sulphides, such as the Broken Hill ores; copper glance; zinc blende; iron pyrites. The last two scarcely float at all. Copper can float if finely ground, but owing to its glance, floats only if slightly weathered, and then only in very small amounts.

With the Broken Hill ores the ratio of Zn to Pb in the concentrate differs very little from that in the ore, only the gangue being left behind. Galena is fairly easy to float if finely ground, but owing to its rather high specific gravity very fine pulverization is necessary to float it successfully. Stibnite and molybdenite go quite easily owing to their greasy nature.

It is interesting to note that ground malachite—copper carbonate—floats fairly well in water. It may be remembered that this mineral has a peculiar greasy feeling. Beyond this, we have not found any other carbonates that float.

This list is only roughly correct, however, and it is probable, in fact, almost certain, that various samples of sulphides differ considerably; and if a slight weathering is necessary to produce the small trace of carbonate needed to give flotation, the "greasiness" in itself is not sufficient to give the separation. It is, in fact, impossible to tell beforehand which ores can be separated by flotation.

Potter originally used dilute acid, preferably sulphuric, of about 2% strength. A saturated saltcake solution is employed by Delprat. We have found that generally the latter solution works rather better than the former. A much more stable and compact scum is formed when saltcake solution is used.

Intermediate Sand Tamping in Blasting.

The use of sand tamping between cartridges, to spread the force of the explosion along the hole and prevent "bull ringing," is more or less common. With the view of testing the system of intermediate tamping, a series of experiments was carried on by J. R. Williams, Mr. Pollitt, Prof. Yates and Wager Bradford at the Langlaagte Deep mine. The first 15 were conducted on the surface and the next 24 underground. The object was to find out to what extent sand and other tamping, interposed between explosive cartridges interfered with their detonation. The surface experiments were carried out by exploding different makes and sizes of gelatine and gelignite in lead tubes and in the open air with interposed tampings of wood, sand and water. The underground experiments were conducted in the stopes, and the conditions, especially in the last 12, conformed as nearly as possible to ordinary working conditions. The conclusions were as follows:

1. While the experiments show that intervening sand tamps up to 12 in. may be used without much fear of missfires, yet it is impossible to think otherwise than that this practice of intervening "tamps" will, in the long run, contribute materially to missfires and accidents, and, therefore, if the practice of distributing the explosive agent along the hole is believed in, the question of using a lower grade explosive to attain the same end might be considered with advantage.

2. But it may be well to point out that while under certain conditions a distribution of the explosive agent along the hole may be advantageous, yet under ordinary conditions such a distribution may place too much of the explosive near the collar of the hole, where energy may be wasted, and too little of it at the bottom of the hole, where a concentration is necessary to overcome the greater resistance, and thus, instead of the charge breaking down the benches clean, there is a danger that only the rock around the collar will be broken, the small amount of explosive at the bottom of the hole being possibly powerless to overcome the great resistance to rending, which the rock there presents.

3. Therefore, under ordinary circumstances, intervening sand tampings cannot advisedly be approved of, and lower grade explosives should only be adopted after careful experiments have demonstrated their superiority to the grade of explosive at present in use.

The practice is condemned as highly dangerous, although the experiments showed that complete detonation occurred in each test underground.

American Institute of Mining Engineers.

The ninetieth meeting of the Institute will be held at Bethlehem, Pa., beginning on February 21, 1906, at 8 p. m.; sessions will be held at Lehigh University. The hotel headquarters will be at the Eagle hotel. Dr. Henry S. Drinker (Lehigh University, South Bethlehem) is the secretary of the local committee. The program for Wednesday evening and Thursday (Feb. 21 and 22) contemplates sessions in Bethlehem; but Friday and Saturday (Feb. 23 and 24) will be utilized for excursions to the works of the New Jersey Zinc Company at Hazard; the Atlas and Lehigh Cement companies; the Thomas Iron Company; the Ingersoll-Rand company (near Phillipsburg, N. J), and the Silk mill of Fitcher & Martin.

Announcement is also made of the London joint-meeting with the Iron and Steel Institute, on July 23, 1906, and the week following. After the London meeting, an excursion to Germany is planned, based on an invitation from the Society of German Ironmasters.

The annual business meeting of the American Institute of Mining Engineers will be held at 99 John St., New York City, at 1 p. m., February 20, 1906.

[1]This statement is contrary to the fact. The theories of Swinburne and Rudorf have been criticized by Prof. A. K. Huntington in a paper, of which we shall shortly publish an abstract. We do not in any way endorse these theories, but present the paper as a contribution on a new and very important subject, which is now only beginning to have a literature.—[EDITOR.]

Wrought Bends in Piping.

BY J. A. MILLER.*

It is only a few years since the old time piper made all bends on the job. The pipe used was rarely larger than 2 in., and the ability of the piper to put crooks and turns in a line of piping was, under the circumstances, remarkable.

Wrought bends will save money, not only in the erection of a line of piping, but in operating cost.

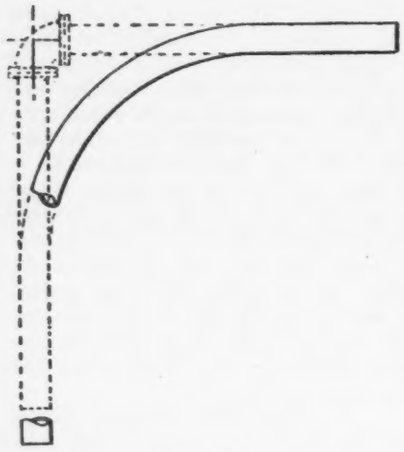

FIG. 1.

As to first costs; a long sweep extra heavy cast iron ell, two extra heavy companion flanges, two corrugated copper gaskets, two sets of bolts, cutting two threads, and the cost of making up two joints, for a 10-in. pipe will be close to $30. To carry the above sized line around a corner, (Fig. 1), it will take 18 ft. of pipe to measure 10 ft. each way in the run,

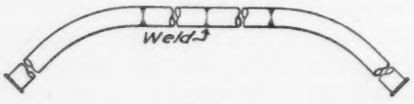

FIG. 2.

allowing for the ell; the same piece of pipe formed into a bend with the proper radius of about 8 diameters will reach a foot further along the line than the same pipe does with the ell, and the entire $30 for the two points is saved, less the cost of bending the pipe. ($8 to $10).

Besides, a saving is effected in the cost of covering the piping, as well as the risk of blow-outs at both sides of the ell or the rupture of the ell itself. The contraction and expansion of a line of piping may increase the strain on the elbow far in excess of its factor and safety,

With modern piping it is now possible to have a number of pieces of any size welded together, obviating all trouble with joints, as well as the actual risk in their use. Such welds can be made more cheaply than ordinary joints. Fig. 2 shows four random lengths of pipe made up into one piece about 80 ft. long and making a 45° bend near each end; this will reach as far around a corner in a line of pipe as five lengths of pipe with an elbow at the cover. Such bends may be made of two or three welded lengths of pipe and shipped easily in lots on open cars and at an enormous saving over the use of ells, flanges, and ordinary fittings.

For water pipe lines for hydraulic work, about mines and for high head water power use, there ought to be more of such bends used, both for results in use as well as for the saving effected in the first installation.

In laying out a pipe system with wrought bends it is important to use the largest radius that is practicable. Eight times the nominal diameter of the pipe is a good rule for the radius and often a larger radius can be used. Bends can nearly always be used with random lengths as to the distance from center of line run to one end or both ends of the bend. The straight pipe used in connection with the bend can be cut readily to fit; but to cut the ends off a piece of pipe and thread it after it is bent is an altogether different proposition.

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Temperatures from a Deep Well in Germany.

BY F. J. H. MERRILL.*

In the study of the physics of the earth's crust, the question of temperature is important; our knowledge of this depends on observations which can be made in deep mines and wells. Hitherto such observations have stated the mean increment in depth at about 1°C. in 30 m., or 1°F. in 55 ft.

An important paper by Prof. F. Heinrich, (*Zeit. f Prakt. Geol.*, Sept. 1904), of Wiesbaden, gave some results on a deep boring at Baruschowitz in Upper Silesia. The well was bored to a depth of about 2,003 m.; the temperature observations were made to a depth of 1,959 m. In all, 64 records were made, at intervals of 31 m., and beginning at a depth of 6 m. These temperature observations are important from the fact that they go down to a previously unknown depth.

The difficulty of observing temperatures in holes at great depth is, chiefly, that in them currents are developed which carry warm water up and cold water down, so that the temperature of the rock wall of the hole is usually different from that of the water in which the observation is made. These currents may be disposed of by cutting a short water-column, or by pumping in fine clay slime, which obstructs the circulation. The latter method was adopted at Baruschowitz. At great depths, when the drill rod nearly filled the hole, but little difficulty was experienced from the currents. When the observations are made after a well has been piped, the observed temperatures in the upper part of the hole are usually too high.

In making the observations, six thermometers were enclosed in a steel capsule which had been tested under hydraulic pressure to 250. This capsule was, in turn, placed within a hollow rod. At each observation point the thermometers were allowed to stand three hours before being withdrawn.

From the detailed table prepared by Prof. Heinrich, the following data are abstracted:

No. of Observation.	Depth in Meters.	Observed Temp. C.
1	6	12.1°
10	285	18.9°
20	595	28.8°
30	905	35.8°
40	1215	46.4°
50	1525	53.8°
60	1835	65.0°
64	1959	69.3°

The differences between adjacent observations were quite variable, rarely being uniform, and ranging from 1° to 2.7°C.

In conclusion, the mean increment was calculated at 0.91°C. for 31 m., or 1°C. for 31.82 m. Other observations at Sperenberg gave 1°C. for 33.04 m.; and at Schladebach, 1°C. for 35.46 m. Prof. Heinrich's observations are specially valuable because of the extreme care used in making them.

It is quite within the power of engineers of mines employed on deep workings to make important observations with little labor; it is to be hoped that some of them will contribute their share toward the accumulation of accurate data on this important subject.

*Mining geologist, New York City.

In an ordinary Argand burner, with chimney, natural gas will give about 12-candlepower in consuming 5 to 6 cu. ft. per hour. If consumed in an ordinary tip, 7 to 8 cu. ft. per hour will yield 6 candlepower. All natural gas has not the same illuminating value. In some districts it carries a small percentage of the heavier hydrocarbons, which add much to its illuminating properties.

The general average price of natural gas to the consumers is very close to 16c. per 1,000 cu. ft. at a pressure of 4 oz. above atmosphere. The greater portion of the domestic consumption is furnished at between 18 and 25c. per 1,000 cu. ft.

Rich deposits of manganese ore are reported to have been discovered in the Paarl district, about 36 miles from Cape Town on the main railway line to the Orange River Colony and the Transvaal. The ore obtained is stated to be of as good quality as any yet discovered in South Africa, and compares favorably with that obtained in southern Russia and Japan. An analysis of the ore taken from the surface showed 71.5% of manganese dioxide. Another specimen, analyzed by J. G. Rose, showed 56% of manganese dioxide.

A Portable Apparatus for the Analysis of Flue-Gases.*

BY CHARLES J. WILSON.

In practice it is often advisable to have analyses of the flue-gases made quickly, wherefore there is a demand for a portable apparatus capable of giving fairly accurate results, and sufficiently easy of manipulation to admit of use by persons other than trained chemists. Various forms of portable gas apparatus have been suggested and used, but the results obtained with them have not, in general, proved to be very satisfactory.

The apparatus to be described was designed with the view of avoiding, as far as possible, the various defects which experience had shown to exist in the instruments commonly used; it was employed in all the trials carried out by the recent Admiralty Committee on Naval Boilers, with good results, and is now used in His Majesty's Dockyards.

The Apparatus.—Referring to Fig. 1, in which it is illustrated diagrammatically, L is a eudiometer, in which the gases are measured, connected by a capillary tube with a "laboratory-vessel" C, in which the absorptions take place. Between L and C is a glass stop-cock A, by means of which communication can be established either between L and C, or between either C or L and the point P. Both the eudiometer and the laboratory-vessel are connected, by means of india-rubber tubing, with movable mercury-reservoirs D and E, the adjustment of which in a higher or lower position gives the necessary pressure for the transfer of gas or liquid in either direction. In order to ensure uniformity of temperature during the progress of an analysis, the eudiometer is water-jacketed, and as it would be difficult to adjust the vessel E so that the level of the mercury in it was precisely that of the mercury in the eudiometer, a comparison-tube G is provided. The eudiometer is calibrated from the point where the capillary tube opens into it at the top to a mark at the bottom bearing the number 100. This space is 50 cc., but it is divided into 100 parts for the convenience of reading off directly percentages by volume. The apparatus is filled with mercury, thus avoiding the errors which are liable to creep in when a gas-apparatus is worked with water or a saline solution. The gas is measured in the eudiometer. The absorbents are drawn into the laboratory-vessel, followed by the gas. After absorption has taken place, the gas is returned to the eudiometer for measurement, and the reagent is expelled at the point P. After a reagent has been used in the laboratory-vessel, water can be introduced into it in order to wash it—and the mercury contained in it—quite clean before any mercury is sent from the laboratory-vessel to the eudiometer, thus keeping the latter clean. Moreover, after an analysis has been made, the eudiometer, the laboratory-vessel, and the tube connecting them can be easily washed out with dilute acid before another gas-sample is introduced.

It is of the utmost importance that the apparatus should be kept as clean as possible. The mercury, when dirty, should be cleaned by shaking it up with finely powdered cane-sugar and filtering it through a pin-hole in a cone of filter-paper, or by some other method. The stop-cocks A and B require lubricating; only castor-oil should be used for this purpose, and of that as little as possible. Should the inside of the apparatus become greasy, it can be cleaned by running methylated spirit through it.

Method of Using.—Where a water-supply is available, the inlet M is connected with the supply and the outlet N with the waste. In the absence of a flow of water, M is plugged and the jacket is filled with water at N. The stopcock B is closed, a small beaker is placed under P, E is filled with mercury, and the tap A is turned so as to open the passage from the eudiometer L to P. As soon as the mercury commences to drop from P, the tap A is turned off. This operation having been repeated for the other side, by pouring in mercury at D, the entire system is filled with mercury. The nozzle P is then connected with the gas to be analyzed; vessel E is lowered and tap A is turned to allow the gas to flow through P into the eudiometer L until the level of the mercury is below the 100 mark; tap A is then turned off. The tubing having been disconnected from P, the height of vessel E is adjusted until the level of the mercury in the eudiometer is two divisions above the 100 mark. By pinching the rubber tube leading from E to the eudiometer, and momentarily opening A, the excess of gas is allowed to escape. A is turned so as to allow a little mercury to flow from C to L, and is then closed. The quantity of gas which was in the capillary tube between A and the top of the eudiometer having thus been driven over into the measuring-vessel, which previously contained 99.6 volumes, will make up 100 volumes. The cock B must now be opened, and the height of E adjusted until the levels of the two mercury-columns in the eudiometer L and the side tube G are exactly the same. If the operations have been performed properly, the eudiometer will now contain exactly 100 volumes. The precise point above the 100 mark at which the mercury must stand so that, after the gas in the capillary tube at the top has been driven over, 100 volumes may result, must be found by trial, as the capacity of the capillary tube may vary slightly in different apparatus.

To make an absorption, a small beaker containing the absorbing liquid is placed under P, D is lowered, and the stop-cock A is turned so as to draw the required quantity of liquid into the laboratory-vessel C. When the desired quantity has been admitted, A is closed. B is then closed, E is raised, and A is turned so as to allow the gas to pass from L to C, followed by

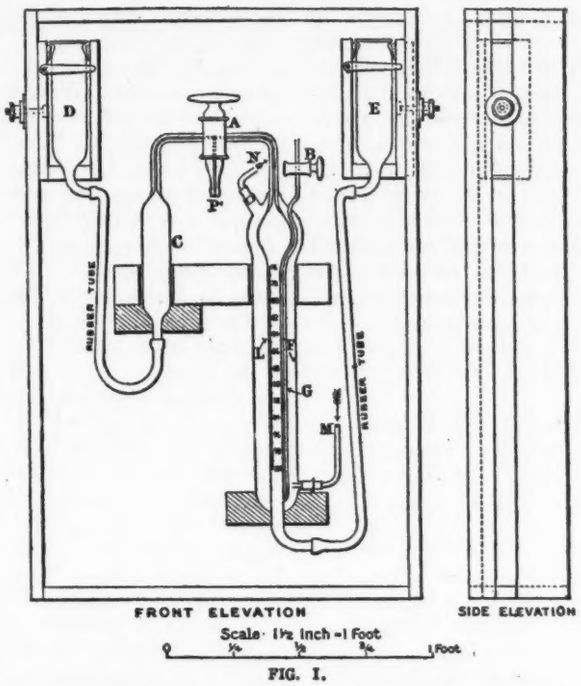

FIG. 1.

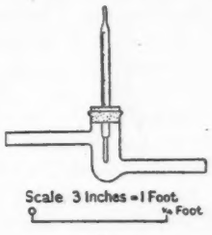

FIG. 2.

*Abstract of a paper in *Proceedings* of Inst. Civ. Eng., 1905, CLVII, part iv.

a small quantity of mercury. By closing A and raising D the gas in C is compressed, and when the absorption is complete E is lowered and A is opened carefully to permit the gas to return to the eudiometer. When the absorbing liquid reaches the capillary tube leading from the laboratory-vessel C, the flow must be carefully regulated and A must be turned off as soon as the liquid has just reached the point where the capillary tube joins the stop-cock. A is then turned to allow the rest of the liquid to flow out from P into a beaker placed for its reception. By lowering D, a small quantity of clean water is drawn in to wash the mercury in C. This water is driven out again and a small quantity of mercury is sent over from C to L to fill the capillary tubes. By opening B the levels are adjusted as before, and the reading is then taken.

Determination of Carbonic Acid.—A small quantity of a fairly strong solution of caustic potash will effect complete absorption of the carbonic acid in a few minutes.

Determination of Oxygen.—A small quantity of pyrogallic acid solution is introduced into the laboratory vessel, followed by sufficient potash solution to make it strongly alkaline. The absorption can be hastened somewhat by moving the mercury-vessel D up and down. When the absorption is thought to be complete, and the gas has been transferred to the eudiometer, the laboratory-vessel is washed out with water, and the gas is tested with a small quantity of fresh pyrogallic acid and potash mixture; any trace of oxygen left will at once become evident by its blackening action on the reagent.

Determination of Carbonic Oxide.—This gas can be absorbed by means of a solution of cuprous chloride in ammonia. After the completion of the absorption, the laboratory-vessel should be washed out with some weak ammonia solution, then a small quantity of dilute sulphuric acid solution drawn into it, and the gas returned and left in contact for a few minutes, in order to free it from ammonia-vapor, before measurement.

At the end of each analysis the laboratory-vessel and the eudiometer should both be washed out with dilute acid. For this purpose a 5% solution of sulphuric acid, colored with a few drops of methyl-orange solution, may be conveniently used. This solution is pink while acid, but becomes yellow when alkaline. In the course of working, it will be found that the mercury is liable to accumulate unduly in one of the vessels D and E. When this occurs, the vessel can be lifted from its containing box, and some of the mercury poured into the vessel on the other side. If it is desired to obtain results with the utmost accuracy, and there is reason to suspect change of temperature in the circulating-water, a small trap fitted with a thermometer, as shown in Fig. 2, can be introduced into the exit-pipe N.

New Mexico Coal.

The report of J. E. Sheridan, mine inspector of New Mexico, for the fiscal year ending June 30, 1905, shows that the total production of coal in the Territory was as follows, in short tons:

	Tons.	Per Ct.
Coal sold	1,472,102	95.9
Used at mines	62,196	4.1
Total mined	1,534,298	100.0

The coal sold shows a decrease of 122,482 tons, or 7.7%, as compared with the previous year. The falling off was largely due to lack of railroad transportation in the first half of the year, resulting from bad weather and serious washouts on the railroads, by which all freight traffic was delayed. In the second half of the year there was an increase in business.

The total number of persons employed at the mines was 2,132, of whom 1,660 worked underground, and 472 on the surface. Of these 52 underground and 37 on surface were classed as boys. The average coal mined per employee was 720 tons per year.

The number of employees killed during the year was five, an average of 2.345 per 1,000 employed. Four of these were killed by falls of coal or rock; one in uncoupling a mine car underground.

The production of coke for the year was 76,737 short tons, an increase of 40,937 tons over the previous year. Of the coke made in 1905, the Dawson Fuel Company reported 49,075 tons. This company has 125 ovens at Dawson, and is building 200 more. The Raton Coal and Coke Co. made 27,662 tons of coke; it has 84 ovens and is building 80 more, at Blossburg.

Mine Inspector Sheridan refers to several projects for developing the coal areas of the Territory, especially the coking coal of Colfax county. Several of these include ownership of coal lands as well as railroad. The report says, on this point: "The St. Louis, Rocky Mountain & Pacific Co. was recently incorporated and has acquired title to the coal areas of the Maxwell land grant. The area of this single ownership is fully 50% greater than the combined area of all the anthracite coalfields of Pennsylvania, and five times as large as the entire Connellsville basin. It is the largest body of coal land under one ownership in the United States.

"The St. Louis, Rocky Mountain & Pacific Co. intends building a line of railroad, 120 miles in length, to connect with the Colorado & Southern at Des Moines, N. M., 80 miles to the east, and to extend west from the mines 40 miles to the gold-mining camps near Elizabethtown. As the operated mines of this company at Van Houten and Blossburg, now have railroad connections with the Atchison, Topeka & Santa Fe Railroad, the new railroad will form another outlet for the product of these mines and place the miners in touch with new markets. In anticipation of an increased demand for coke from these mines, 80 additional coke ovens are being built, which, with 84 now in use, will make 164 ovens in commission within a few months, and it is contemplated continuing the work of building coke ovens until a total number of 300 are erected. This increase in oven capacity will necessitate doubling or trebling the washery capacity at these mines.

"At Raton, N. M., in the coal area adjoining the Maxwell land grant on the northeast, the Raton Fuel Co. is making preparation for extensive development. A railroad company has been incorporated, under the name of the Santa Fe, Raton & Eastern Railroad Co., several miles of railroad have already been built by this company, to connect with the coal mines of the Raton Fuel Co. and other coal mines on Barela and Johnson mesas.

"The great Dawson coal field, embracing about 40,000 acres of coal land, lying to the south of the Van Houten mines, has changed ownership within the past six months, together with the El Paso & Northeastern Railroad, and the Dawson Railroad, the lines over which the coal is transported to market. It is reliably reported that the great copper-mining company known as the Phelps, Dodge & Co. is the controlling factor in the new ownership. The names of the corporations owning the Dawson mines and railroads named have not been changed. Phelps, Dodge & Co. owns extensive copper mines at Nacozari, Mexico, and at Bisbee, Globe, and Morenci, Ariz., together with large smelters. The estimated consumption of coke at these smelters is about 25,000 tons per month, all of which will probably be produced from the Dawson mines. Three hundred new coke ovens are now in course of construction, in addition to the 125 ovens now in operation at Dawson, and it is highly probable that the number of ovens at the Dawson mines will be increased to at least 500. Already a survey has been made for a new line of railroad from Dawson, to Santa Rosa, via Las Vegas, which will shorten the distance 50 miles between the mines, the El Paso, Tex., market and the Arizona smelters."

In his report for 1905 the commissioner of patents states the imperative need of an increased force and additional office facilities to cope with the business, which showed a remarkable increase during the last year. In 1905 there were received 54,034 applications for mechanical patents, 781 design patents, 156 reissues of patents, 16,224 applications for registration of trademarks, 1,068 labels and 467 prints. There were 30,270 patents issued, including designs. The total receipts were $1,806,758, and the expenditures $1,479,633.

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*Illustrated.

THE STRUCTURAL CONDITIONS over a large area in West Virginia indicate that it will be a source of a vast quantity of natural gas for many years, which will be used to supply the decreasing volume that must necessarily follow the exhaustion of the fields in Pennsylvania and Ohio.

Faults in Coal Seams.

The approach to a fault in coal seams is often indicated by numerous stone-bands in the coal, and by the strata having a dip in the direction in which the slip has occurred. Pinchouts, horsebacks, and similar disturbances are usually indicated by the roof and floor of the seam gradually approaching each other. Erosion faults are mostly indicated by the presence of stones or boulders in the coal and a gradual thinning of the seam. These indications, however, cannot be taken as absolute evidence of the approach of faults, as many occur abruptly. As a rule, each coal seam presents certain characteristics, and the only way to anticipate changes is to study the geology of the formation thoroughly.

The Metal Markets.

The recent declines in the prices of copper, lead and spelter, and the evident weakness in those markets, are indicative that the zenith of the recent boom was attained at the end of 1905 and has now been passed. The meaning of this is that prices had been forced to a level at which consumption began to be restricted, the inevitable operation of a natural law thus coming into play. It is true that there has not yet been manifest anything more than a suspicion of weakness in the iron market, the barometer of trade, but because of its high sentimental effect and direct influence on the stock market, unfavorable signs in the demand for iron are slow to be admitted. We are all naturally bulls, rather than bears. The declines in copper, lead and spelter may be only slight recessions to a sounder basis. The behavior of the iron market will be the best guide as to what may be expected of the immediate future.

Bessemer Steel Production.

The production of bessemer steel in the United States in 1905, like that of pig iron, was the largest ever reported. It is given by the American Iron and Steel Association at 10,941,375 long tons, an increase over 1904 of 39 per cent.; and over 1902—previously the year of greatest output—of 19.5 per cent. This final total was closely approached in our issue of Jan. 6 last, which gave the estimated output at 10,950,000 tons. Except the increase, there was no material change in the production of converter steel; as in previous years, it was all made by the acid process, and no basic converters were in use.

About one-third of the bessemer steel made was converted into rails last year. The total make of rails was 3,372,257 tons, of which 3,188,675 tons were made from bessemer steel, basic open-hearth steel furnishing the balance. Iron rails have almost disappeared, only 318 tons having been made in 1905, and those were mine rails of light section.

A feature of the rail production was the increased proportion of heavy sections; no less than 46 per cent. of the total having been of 85 lb. to the yard or over.

The figures for open-hearth steel are not yet complete; but they will show a still heavier increase than those for bessemer.

Copper Imports and Exports.

Both the imports and exports of copper in the United States were large in 1905. The totals, including metallic copper and copper contents of ore and matte, were as follows, re-exports of foreign metal being excluded; the figures are in long tons:

	1904.	1905.	Changes.
Exports	252,441	244,025	D. 8,416
Net imports	81,341	93,306	I. 11,965
Bal., exports	171 100	150,719	D. 20,381

A heavy decrease in the exports was prevented by large sales to China. The total to other countries was 39,812 tons less last year than in 1904, but the shipments to China increased from 4,644 to 35,687 tons. The causes of this movement have been heretofore discussed in our columns.

In comparing the two years given in the table, however, it must be remembered that 1904 was a year of exceptionally heavy foreign demand. In 1903 the exports of metallic copper were 138,719 tons only, or 100,079 tons less than in 1905; so that last year must be considered one of heavy foreign trade.

Of the imports last year 22,368 tons were in ore and matte, and 70,938 tons metallic copper. Only a comparatively

small part was refined copper, however, most of it being in the forms of black copper, copper bullion, etc., sent here to be refined. Mexico was the largest contributor, furnishing 58,721 tons, or 62.5 per cent. of all the imports; while Canada supplied 17,429 tons, or 18.6 per cent. South American countries appeared as a factor last year, their total being, however, only 671 tons contained in ore and matte.

The Coal Mining Deadlock.

The rate conference at Indianapolis came to an abrupt end last week, when Francis L. Robbins, of Pittsburg, as spokesman for the operators, announced that no advance in the mining rate could be conceded, in the present condition of the trade. The miners' representatives voted to adhere to their demand for a higher rate, and the conference was at an end. The vote of the miners was not unanimous, President Dolan, of the Pittsburg district, advocating an acceptance of the operators' terms. For this action, however, he has since been called to account by his district, and his resignation demanded.

The present situation is, therefore, a dead-lock, with no indications that either side is preparing to give way. It is still seven weeks, however, to March 31, when the contract expires, and many things may happen in that time. The conference may be called to meet again, and it has happened before that agreements have been reached, even when both sides seemed to be as determined as they are now. Much depends on the result of the anthracite conference, which is expected on Feb. 15; and it is probable that the action of the leaders at Indianapolis had some reference to this point.

It is not safe to assume yet that there will be a general strike on April 1. Such a movement would be a great blow to trade, affecting all branches of business most unfavorably. Nevertheless it must be admitted that the outlook is ominous, and is evident that precautions will be taken, to meet the contingency of a stoppage, by most large consumers.

The miners and operators in the Southwestern conference were even further apart in their views than those concerned in the more important Central meeting. That conference also adjourned without result.

Pig Iron in 1905.

In the JOURNAL for Jan. 6, 1905, the production of pig iron in the United States in 1905 was estimated at 23,010,625 tons; a quantity which was within 0.01 per cent. of the actual output. The completed figures collected by the American Iron and Steel Association give the total for the year as 22,992,380 long tons, the greatest ever recorded; the total exceeds by about 3,000,000 tons the combined make of Germany and Great Britain, our two chief rivals. The increase over 1904 was 6,495,347 tons, or 39.4 per cent.; over 1903 —heretofore the year of greatest production—it was 4,983,128 tons, or 27.7 per cent. These figures emphasize both the great demand and the large increase in producing capacity within the past three years.

The production, under the old classification by fuel used, is divided as follows:

	1904. Tons.	1904. Per Ct.	1905. Tons.	1905. Per Ct.
Coke and bitum's.	14,931,364	90.5	20,964,937	91.2
Anthracite	1,228,140	7.5	1,674,515	7.3
Charcoal	337,529	2.0	352,928	1.5
Total	16,497,033	100.0	22,992,380	100.0

Coke was the chief fuel used, very little iron being made with raw bituminous coal in this country. Many of the anthracite furnaces even use some proportion of coke as fuel. Coke is practically the fuel with which 95 per cent. of our pig iron is made.

The better classification, by purposes for which the iron is intended, divides the output as follows:

	1904. Tons.	1904. Per Ct.	1905. Tons.	1905. Per Ct.
Foundry & forge	4,358,295	26.4	5,837,174	25.4
Bessemer	9,098,659	55.2	12,407,116	54.0
Basic	2,483,104	15.1	4,105,179	17.9
Charcoal	337,529	2.0	352,928	1.5
Spiegel and ferro.	219,446	1.3	289,983	1.2
Total	16,497,033	100.0	22,992,380	100.0

The largest proportional increase was in basic pig, and indicates the rapid growth in the use of the basic open-hearth furnace in this country. Charcoal iron continues nearly stationary and is not likely to show any large gain in the future.

The production by districts for three years past is given in the table below:

	1903.	1904.	1905.
New England, N. Y. & New Jersey	782,350	880,074	1,525,094
Pennsylvania	8,211,500	7,644,321	10,579,127
Ohio, Illinois, Mich., Wisconsin & Minn.	5,508,034	5,077,549	7,260,712
Maryland	324,570	293,441	332,096
Southern States	2,912,500	2,449,872	2,887,577
West of the Missis.	270,289	151,776	407,774
Total	18,009,252	16,497,033	22,992,380

In this grouping Maryland has been put by itself because its production is chiefly from a single group of furnaces, in which imported ores are used. The great increase last year was fairly uniform in Pennsylvania and the Central West, which furnish about three-quarters of the pig-iron output. In the East the gain was above the general average, this being due to the new furnaces of the Lackawanna Steel Company at Buffalo, which came into full operation in 1905. The South makes a poorer showing than had been expected, the gain last year over 1904 being only 17.9 per cent., while the total was 24,932 tons—or 0.9 per cent.—below that for 1903.

Making the necessary deductions for furnaces in New England, New York, New Jersey and Eastern Pennsylvania, which use local ores, the table shows that over 75 per cent. of the pig iron made in 1905 was from Lake Superior ores. The increase in New York production, as above noted, was chiefly from furnaces which use Lake ores.

The approximate consumption of pig iron in 1905 was as follows:

Production, as above	22,992,380
Imports	212,465
Total	23,204,845
Exports	49,221
Approximate consumption	23,155,624

In these figures no account is taken of stocks on hand, which did not differ greatly during the year. The approximate consumption showed an average of 463 lb. iron per capita for this country.

A Drastic Measure in Mexico.

Mexico has been for ten years the Mecca of mining adventurers, especially Americans. They have desired to enter that country and have been desired. Their advent, together with the capital drawn there by them, has resulted in a wonderful development of the industries of Mexcio. This is fully appreciated by the Mexicans. They encouraged the immigration, aided the establishment of new undertakings, and supported them fairly to the best of their ability and in full performance of all promises. The attitude of the Mexican Government has in no way changed.

Among the foreigners (chiefly Americans) who went to Mexico, there were many—indeed we may say the majority—who demanded and looked for nothing more than a square deal. They were the ones who built up the prosperity of Mexico, and the value of their services is recognized by the Mexicans. Unfortunately there were many who looked upon

the mineral deposits of the Republic merely as treasure-troves for despoiling, and when wealth has not been forthcoming as easily as hoped for they have turned kickers. They have forgotten that the Mexicans had any right to their own mineral resources; and have berated the proper collection of the nation's share through taxation. They have forgotten the inaccessibility of many of the mining districts, the difficulty of communication, and the short organization of legal order; and have complained of alleged lack of protection, although the fair observer applauds the marvellous progress that the Government has made in that particular. They have forgotten that they were working in the country of a different people, speaking a different language and possessing different customs; and have jeered at the legal practice and business methods of the natives.

Such behavior, even by only a small portion of the foreign population, was bound to lead, sooner or later, to some action by the Mexican Government. We have the first example in the order of the Department of Public Works, Colonization and Industry, under date of Dec. 30, 1905, suspending the right of denouncement of mines in Sonora and a portion of Baja California. The following is a translation of the first paragraph of the order:

"Owing to complaints having been made by some foreigners to whom titles have been granted to exploit mines in the State of Sonora and the Northern District of Baja California, that they do not enjoy security and protection to work their properties, and having slandered the respective authorities in alleging that they do not extend them protection, the President of the Republic has ordered that for the present, and until further orders, there shall not be admitted in the mining agencies of the said State and District applications to acquire mines that may be presented by foreigners."

The second paragraph of the order suspends action on all applications then under consideration.

This drastic measure has caused much excitement among the Americans in Sonora and has put operations in a bad way, most of the mining enterprises in that part of Mexico being in the hands of Americans. We believe it is only a temporary ruling, and that after a reasonable time the ban will be removed, but we hope it will prove a lesson to the adventurers that Mexico is not solely for Americans. The Mexican Government has made mistakes. Its treatment of the Yaqui Indians, which has been directly the cause of much of the trouble in Sonora, appears to us to have been a mistake. Its granting of a dynamite monopoly was also a mistake, although the evils that have arisen under it have been rather the bad faith of the grantee than the fault of the Government. But there is always a way to rectify a mistake, and we have no doubt that the Mexican Government will take the proper action with respect to such errors when it becomes convinced that they are errors.

The Needs of the Yukon.

The member for Yukon Territory in the Canadian House of Commons, Dr. Alfred Thompson, who is well informed on the chief needs of the district he represents, voices general opinion in a recent statement that there are at the present time requiring attention two matters of paramount importance to the Yukon: the adoption of a mining code and the obtaining of sufficient money to provide adequate water supply for mining purposes. Next, and close to these, comes the necessity for a material reduction in the cost of transportation.

Regarding a mining code Doctor Thompson advocates the incorporation of the mining laws in an act of Parliament, thus rendering them changeable only by the Dominion legislature, instead of leaving them in a measure at the will of the Department of the Interior. Not only the large placer-mining interests of the Yukon require such a guarantee of comparative stability, but quartz mining (especially in the Windy Arm section of the Territory where lode mining promises to become soon an important industry) also needs less unstable conditions than can exist so long as the department shall retain power to make regulations affecting mining. The Commissioner of Yukon Territory and the members of the Yukon Council have already obtained much useful data and information relative to mining in this section, so that there should not be any difficulty in drafting an act that would be workable and, as well, sufficiently comprehensive to include all branches of mining in the Yukon.

The water-supply problem has already been receiving the attention of the Dominion Government to the extent that one of its engineers has for several months been occupied in making surveys to secure information for a report on the situation. The great need for a large supply of water to admit of the economic working of the immense areas of low-grade gravels occurring in the Yukon will be strongly urged upon the Government, and the carrying out of an adequate water-supply system will be asked for.

The imperative necessity for a considerable reduction in transportation costs is generally recognized. A sub-committee of the Dawson Board of Trade has been giving this subject careful consideration. In the course of a report recently submitted to the board, this sub-committee says: "Our investigations confirm us in the belief that a material reduction in freight rates is necessary for the country's future life. The high rates since 1900 have been inconsistent even with a great production of gold, and the cost of producing is too high for the present time. We must now face a new condition—the creek bottoms, where the richest placer gold has concentrated, are now practically worked out, leaving only the hill sides, higher levels and old channels, which require hydraulicking, the building of immense water systems, impounding of waters in reservoirs, the installation of dredges, etc. The speculative era is past, and all that is required for the successful working of these gravels is economical methods of procedure."

It is estimated that in the Klondike mining division of Yukon Territory there are 600,000,000 cu.yd. of gold-bearing gravels which will yield 35c. per cu.yd., to say nothing of the vast areas in other parts of the territory which contain similar deposits. The procuring of capital and men to open up and develop these enormous resources depends largely upon cheaper transportation.

The lower cost of transportation will also affect the cost of living, which still remains very high, though it is much less than in the early days of the Klondike. This will mean a range of wages for labor approximating that which prevails in British Columbia. The favorite project at present is an interior line which will connect Dawson as a center with the Grand Trunk Pacific when completed; and with the grain-growing and farming districts of Alberta and Saskatchewan.

For all these needs the Yukon relies largely upon government assistance.

Metallics.

Natural gas is produced in limited quantities in South Dakota, Missouri, Arkansas, Louisiana, Texas, Alabama, Colorado, Wyoming, Utah, California, and Alaska.

The two-cycle engine usually runs in either direction with equal effectiveness, but it is not reversible, in itself; it must be stopped and then, by turning the wheel, started in the desired direction.

Ground glue requires very little soaking, but flake glue should be soaked in cold water over night before using. All dirty spots should be cleaned out before using a different kind of glue. For soaking glue fresh water should be used.

There is no accounting for the vagaries of some pipe men. There was a mine where, in a vertical shaft, an 8-in. main was reduced 200 ft. from the surface to 6-in., and at 1,000 ft. was changed back to 8-in. again. It cost a pretty penny to rectify that error.

The cemented joints of terra-cotta tiles frequently open, making leaks and necessitating repairs. Another trouble with tile roofs is that the cement used, being often stronger than the tile itself, the latter cracks or opens from temperature expansion or contraction. An elastic holding or jointing medium must be used.

Increase in size of muffle has been found to be a great advantage in bullion assaying and in cupellation work, and if the muffle is suitably shaped a more even and easily maintained temperature is experienced. In some assay offices muffles are used which are not large enough for this delicate work.

The Western Australian Commission on Mine Ventilation suggests that the CO_2 standard is not strict enough for countries where the mines do not give off CO_2 from the ground, as is the case in that Colony. Its recommendation is that the air shall be condemned "if, without special authorization, the carbon dioxide exceeds 0.15%, or if the oxygen falls below 20 per cent."

Leaky tubes in boilers are usually caused by inequalities in contraction or expansion; one of the principal causes of failure from this source is poor circulation, the difference in temperature in different parts of the boiler sets up strains that result in opening joints and straining connections. The use of cold feed-water or the method of introducing feed-water into the boiler is also a source of trouble.

Machine-drill runners are seldom under orders to drill and blast their holes on the same shift, but it is often very difficult to prevent them doing so. Long holes are economical, but if long drills are lacking and a miner finishes his four holes an hour before blasting time, that hour need not be wasted. If he is a good man, he will pull down and rig for his mate, and when this is done no time is lost.

Air mains in mines are often installed too small and with no margin of capacity. It is a prime necessity to keep hose and pipes tight, and the latter as straight as may be. The mains and laterals should be of ample size. It is a good rule never to use an elbow, if it can be helped, and to use, when possible, one large pipe rather than two or more small ones, but even this common-sense rule is violated frequently.

H. M. Randall, by using the method employed for the determination of the coefficient of expansion of quartz, has determined the coefficient of expansion of nickel at temperatures up to 392° C. The coefficient of expansion rises until a temperature of about 280° is reached and then becomes sensibly constant at 0.0000164, up to 392°, at which temperature it again shows a slight tendency to rise. The anomalous expansion, 365° and 370°, as found by Harrison when experimenting on a nickel wire, was not observed by Randall.

In regard to the fireproof qualities of sand-lime bricks, samples which were placed in a kiln of the Mitchell Fire Brick Co. of St. Louis showed no change of form after withstanding the heat of the kiln for eight days, and the practice in the plants built by certain companies is to line the boilers with these bricks, and they stand well; but it is not claimed that they are more durable than ordinary building brick. In several instances where fires have occurred in buildings built of sand-lime bricks, the results have shown greater resistance to heat than ordinary clay bricks.

Blue-prints that are to receive a good deal of handling are sometimes mounted on a piece of wood or stout cardboard. In electrical establishments the iron plates used for armature punchings are also used for this purpose; they are even better than the wood or cardboard. The blue-print may be pasted down, or, if the iron plates are used, these are first shellacked and the blue-print spread out on this before it has a chance to dry; care must be taken that all wrinkles and blisters are smoothed out. After it is dry it may receive one or two coats of thinned white shellac, which will spread easily over the surface of the blue-print.

Some mines are run with such low air pressure that the maximum rock drill efficiency is not attained, but it should be remembered that in many cases the number of rock drills working has so far exceeded the original estimate of the number required, that the compressor plant is not equal to the demands made upon it and has to be run beyond its proper speed to keep the air at the collar of the shaft at even 60 lb. pressure. In these cases it will be generally admitted that more air is needed, but it is a different matter to get money for additional plant. Under such conditions, in some cases, an increase in the size of the air mains would improve matters.

The only liquid-air factory west of the Mississippi is connected with the university of Kansas at Topeka. For five years the chemical department of the university has had an outfit costing $2000 that has a capacity of $3.50 worth of liquid air an hour. The only colleges with equipment for manufacturing liquid air are Cornell, Connecticut, Wesleyan, Michigan and Kansas. There are factories in Washington and New York for making the air for commercial purposes. The Cornell plant was the first equipped and Kansas was second. The machine was not installed for commercial use; it is intended for experimental purposes in the chemical laboratories of the university. Air is, however, sold to those who desire it at the rate of $2 per gal. The demand for the output is increasing, so that it has averaged more than 100 gal. a year since the plant has been installed.

The known main productive areas of natural gas in the United States are the northeastern portion of the Mississippi Valley and the mid-continental area in southeastern Kansas. The arches and domes on the west flank of the great Appalachian uplift, reaching from western New York to southern central Kentucky, continue the main sources of supply. The slopes of the great Cincinnati uplift (the source of former activity in northwestern Ohio and central Indiana) have been largely productive in the past; the newer field in eastern central Ohio has also furnished large quantities. The more recent fields of southeastern Kansas, Indian Territory, and Oklahoma are rapidly coming into prominence as prolific gas as well as petroleum areas. The areas named produced in 1904 over 99% of the total value of all the natural gas in the United States.

The Brehmer arc lamp, otherwise known as the "flaming-arc," is vastly superior to any other form of light-source for outdoor illumination. It has a higher efficiency, and the predominance of yellow rays, together with the high total candle-power that can be produced, and the better distribution, are all advantages for this class of lighting. It requires more frequent trimming; but this extra labor is counterbalanced by the advantages just mentioned. Trimming every day is absolutely requisite. On account of their high total candle-power — a 4000 candle-power lamp being entirely practical—they can be placed much higher. This is advantageous; as a matter of fact, the gases produced by the combustion of the carbon are so deleterious that the lamp must be kept in the open, and this means a sufficient hight to disperse the CO_2 that is produced.

Colliery Notes.

On long haulage grades of 3000 to 5000 ft. above 3 per cent. steel-rope haulage is cheaper and more effective than independent electric or compressed-air locomotives.

A mixture of tar, pitch or asphalt applied to briquetting coal prior to charging the press, forms a fine binding material which adds to the appearance and handling qualities of the briquettes.

As a rule coal cutters of the compressed-air puncher-type are more effective than electric cutters in low coal workings containing clay spots, which are much faulted. Rotary coal cutters are best suited to thick seams of clean coal.

Compressed air is sometimes used as a temporary relief in rooms in coal mines when the fan currents are insufficient. It is not an advisable proceeding, and is evidence of bad management. Every coal mine should have a fan capacity ample for all calls made upon it.

A shot in a coal seam that finds vent into the mine workings through a crack or crevice in the seam without breaking any coal is often called a "squealer." It is a source of great danger, and is the frequent cause of serious explosions. All crevices should be carefully avoided when boring shot holes.

The constant energy supply in coal mines is used in ventilating, pumping, lighting and heating. The fluctuating energy is required in cutting, hauling and drilling. The fluctuating limits in some mines are more than in others, depending on methods employed, extent of workings and amount of coal mined.

Corrosion of the delivery pipes from mine pumps can be prevented by asphalting, inside and out, all pipes used for discharging mine water. It is a good policy to asphalt all pipes employed in a coal mine, as it will prevent the deterioriation of iron pipes that are exposed in damp places, or which are stored away while not in use.

It is not generally known that the first coal-cutting machine in Pennsylvania was patented by Simpkins, of Allegheny, in 1858. Mechanical coal cutters, however, were not successfullly employed until many years later. The labor troubles in 1895 were chiefly responsible for the wide introduction of coal cutters in American mines.

A seam of coal, 16 ft. in thickness, has been discovered at Wingen, New South Wales, in the vicinity of the "burning mountain," at a depth of 70 ft., and about 300 ft. from the Great Northern Railway. It had long been known that there was coal in the locality, but this is said to be by far the largest seam that has ever been cut there.

When timber sets are broken, and the coal is free and liable to run, care should be taken to see that the old timber is not disturbed until every precaution has been taken to prevent the fall of the loose material. The lagging over and behind the timber should be properly braced. Then the fractured timber can be withdrawn and replaced piece by piece by new timber.

Asphaltic coal occurs in Oklahoma and Arkansas. It has a jet-black color and a hackly fracture. It disintegrates when exposed to atmospheric weathering. It is generally found in irregular seams and lenses in sedimentary rocks, and is believed to be due to the natural distillation of petroleum. Asphaltic coal is used for the preparation of paints and varnishes, rock pavements, coating iron pipes used in mining operations and for many purposes that pure asphalts are used for.

The comparative cost of raising and sinking depends upon local conditions. In raising, the excavated material has either to be stowed in abandoned workings or hoisted to the surface. The cost of doing this will vary according to circumstances in every colliery. As a rule, the actual cost of raising, leaving out of consideration the disposal of the excavated material, is cheaper than sinking; on account of the material being handled by gravity, besides lighter shots and less explosives are required, and there is an absence of pumping and hoisting expenses.

The bonnets, or covers, to a mine cage should always be arranged with a slight slope toward each end of the cage, and should be large enough practically to cover the entire cage. In order to protect the cage at the shaft-bottom, the cage bonnets should be high enough to insure that falling coal striking the bonnets will not be thrown directly into the entry. In addition to the cage bonnets, strong hoods should be placed around the entry so that when the cage is at rest at the bottom of the shaft, the cage bonnets will fit upon the hoods and prevent anything falling below to endanger the men.

Tests made in a 7-foot seam of clean coal, with the object of finding the proper quantity of powder to bring down the coal most effectively, showed that, as a rule, too much powder is employed in American coal mines. In a room 30 ft. in width the "snubbing" was done by three shots—one being placed in each rib and one in the center. The holes were charged with about one-half pound of powder. It was found that the coal was broken well, but there were many large blocks that required to be broken by hand. In another experiment one hole was charged with 1 lb. of powder. This shot brought down more coal than the three previous shots and the coal was in good condition for hauling. Two rib shots, charged with ½ lb. of powder each, brought down the rest of the coal.

Correpondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Placer Mining in Dutch Guiana.

Sir—What is a "pork-knocker?" According to the annual report of the Institute of Mines and Forests of British Guiana he is a human being—a squatting miner, in fact—who is to be found in the goldfields of the colony's up-country. Some members of the species, it seems, are decent, hard-working adventurers; but by far the larger number are men who, happily for the inhabitants of Georgetown and the Coast, are in the bush. Here their practice is to poach on the claims, and to entice away contracted laborers. In spite of the squatter of the malevolent kind, however, the gold industry of this old-time auriferous region appears to be progressing—97,911 oz. in year 1904-5, against 87,442 oz. in 1903-4.

But why "pork-knocker?" A "pork-knocker" was so called because in the early days he knocked about the gold bush without having any visible means of support, begging, from placer to placer, doles of salt beef or pork sufficient to keep body and soul together. Gradually the number of such men increased; and with their increase they began to work on their own account, but not always on their own placers. With the gold they won from other people's property they purchased their supplies of pork instead of begging them. But the name has stuck, and now even respectable gold-diggers who work in a small way are designated "pork-knockers."

E. H. TEATS.

New York, Jan. 31, 1906.

The International Separator.

Sir—After a prolonged absence from New York, which has made it difficult to refer to the matter sooner, I call attention to an article which appeared in the JOURNAL of Sept. 2, 1905, entitled "The Snyder Magnetic Separator," by Frederick T. Snyder.

The essential feature of the machine described in this article consists in the construction of the cylindrical armature. This is made up of wrought-iron, toothed disks, so assembled that the teeth of the adjacent disks are staggered, or placed out of alinement. This invention was the subject of an interference in the U. S. Patent Office between Mr. Snyder and myself. The interference was decided in my favor, and the patent No. 791,494 was issued to me under date of June 6, 1905.

Moreover, it is a fact that upon the name plate attached to the separator ill-

ustrated in the article, as well as in the case of all the machines built by the International Separator Company, there are enumerated the numbers and dates of a series of U. S. patents, none of which were issued to Mr. Snyder.

Under these circumstances, it would seem that professional courtesy, if nothing more, might have prevented Mr. Snyder from claiming as his own an invention to which he is not entitled.

C. Q. PAYNE.

New York, Feb. 1, 1906.

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Borax Industry in 1905.*

BY CHARLES G. YALE.

Almost the entire production of borax in the United States, during 1905, continued to come from San Bernardino, Ventura and Inyo counties, Cal., although surface deposits in Nevada near the California line now produce a small quantity. The colemanite deposits in San Bernardino county, Cal., are the largest producers, and the deposit owned by the Borax Consolidated Co., Ltd. (Pacific Coast Borax Co.), is the greatest of these. The American Borax Co., in San Bernardino county, is the second producer in importance. This company is working a low-grade borate of lime, from which boric acid is produced by a special process. The Western Mineral Co., which began operations only near the end of 1905, is working the same class of material. The Palm Borate Co. also owns properties in the neighborhood of Daggett.

In Ventura county the Frazier Borate Co. is mining material which is shipped to San Francisco and refined by the Stauffer Chemical Co. The Columbus Borax Co. is also operating a deposit in the same county.

Near Big Pine, Inyo county, the Western Borax Co. is working marsh dirt or mud that carries from 8 to 10% of borax. The output in Inyo county is limited by reason of the difficulties of transportation and recently by the scarcity of white labor. Activity in the gold mines of that district lured away most of the white men last year, and Chinese laborers had to be substituted.

Along the Mohave desert and the Death Valley region of California are numerous small deposits of low-grade borax, which will doubtless be utilized in the future. The "cotton ball" surface deposits near Winnemucca, of Nevada, are being worked to a limited extent, the earth carrying about 15% of borax.

The most of the borax of this country comes from the colemanite mines of the Pacific Coast Borax Co., at Borate, San Bernardino county. The output here increased during 1905, and the roasters at Marion are now running at double capacity because more low-grade material than formerly is being mined. All the ore that averages 35% or more is shipped East directly, but the lower grades are first concentrated at Marion. Increased demand for borax warrants a greater output from the mines.

The company's improvements to its property will have a decided effect on the borax industry in the United States. It is building a railroad from Ludlow, San Bernardino county, on the Santa Fe main line, to Amargosa Valley in Inyo county, near Death Valley, by which to transport borax from the Lila C. mine. Extensive developments have been progressing for several years in this mine, where there is a body of colemanite of fine quality which will be shipped on completion of the railroad (131 miles) expected in July. It will open up a promising mining region before it reaches the borax property for which it is intended; it may be extended to Bullfrog, Nev., where it will handle the ores from other mines in that region.

The Pacific Coast Borax Co. also owns borax properties in Nevada, including Teel's Marsh, which is now nearly worked out. Among other properties owned by the company are several in and around Death Valley, which have not yet been worked, but can be, if desired, on completion of the new railroad. There is very little profit in manufacturing borax on a small scale from low-grade material.

No marked changes have occurred during the past year in the prices of either crude or refined borax; the refined material was a trifle lower during 1905 than in the previous year. The New York market prices have been, for refined borax, about 6½@6¾ c. per lb. delivered, which is about ½c. per lb. lower than in the previous year. Chicago pays less than New York, although the material has to be shipped from California to New Jersey, refined, and then shipped back to Chicago.

The refiners of borax in the United States are as follows: Borax Consolidated (Ltd.), Bayonne, N. J.;Pfizer & Co., Brooklyn, N. Y.; Brighton Chemical Co., New Brighton, Pa.; Thos. Thirkelson & Co., Chicago, Ill.; and Stauffer Chemical Co., San Francisco, Cal. A small quantity of borax is refined by producers in California and Nevada, but this product does not find so ready a market as that handled by the larger refineries.

*Abstract from *Press Bulletin* No. 215. Jan. 29, 1906, U. S. Geological Survey.

Alundum is the trade name of artificial corundum, made by fusing bauxite.

The Illinois Geological Survey.

The State Geological Commission, at its recent meeting at Springfield, completed the corps and arranged for the season's work. The following appointments were made to the regular force; and, in addition, the director was authorized to make such temporary appointments as might be necessary, subject to confirmation at a succeeding meeting of the commission: Prof. C. W. Rolfe, of the State university, consulting geologist in clay work; Prof. R. D. Salisbury, of the university of Chicago, consulting geologist in charge of educational work; Dr. U. S. Grant, of Northwestern university, consulting geologist in lead and zinc work; Prof. S. W. Parr, of the State university, consulting chemist in coal work; Dr. Edward Bartow, director State Water Survey, consulting chemist in water work; F. B. Van Horn, recently of the Missouri Geological Survey, assistant geologist; F. F. Grout, recently of the West Virginia Geological Survey, assistant chemist; H. B. Fox, of the State university, assistant geologist; J. A. Udden, professor in Augustana college, geologist; W. W. Atwood, of Chicago university, geologist; Dr. Stuart Weller, of Chicago university, geologist; Ross C. Purdy, of the State School of Ceramics, ceramist.

Not all of the men appointed will be able to devote their full time to the survey work, but all will give some time to it. Prof. Rolfe and Mr. Purdy, assisted by Mr. Fox, will devote particular attention to the clay resources of the State, beginning with a study of paving brick and the clays used in its manufacture.

Prof. Parr, Mr. Grout, Mr. Van Horn and the director of the survey, Mr. Bain, will devote their time largely to a study of the coalfields. It is proposed to take samples of the various seams and to study their qualities as well as their distribution in the field. In the latter work Dr. Weller and Mr. Atwood will assist.

Prof. Udden will devote his time to a study of the underground waters of the State, with a view to the determination of the limits of the various artesian basins, and the depth to which it is necessary to go to obtain good water for municipal and other purposes. In this work he will be assisted by Dr. Bartow and by the State Water Survey, which will make the necessary analysis and laboratory tests.

Dr. Grant, with such assistance as may be necessary, will take up the study of the lead- and zinc-fields found near Galena, continuing the work done by the State of Wisconsin.

Prof. Salisbury, assisted by various others yet to be appointed, will prepare a series of bulletins for use in the schools, descriptive of the geography and the geology of important type localities within the State. So far arrangements have been made for such bulletins covering the lake shore from Evanston north; the Illinois valley near Peoria; the Mississippi valley between Savanna and Rock Island, and at East St. Louis. The first of these bulletins is now being prepared by Mr. Goldthwaite, of Northwestern university, and Mr. Atwood of Chicago.

Phosphate Rock in 1905.

According to *Press Bulletin*, No. 215 (Jan. 29, 1906) of the U. S. Geological Survey, in all of the three States in which phosphate rock is mined the production was greater in 1905 than in 1904. The increase was more marked in Florida and Tennessee than in South Carolina.

During the winter and spring of 1905 the rainfall was very slight and the water level was lower than it had been since 1899. Owing to these conditions, the production of high-grade phosphate rock was unprecedented. Reverse conditions made mining difficult and the production of the second half of the year was consequently below the average. The demand for high-grade rock at advanced prices has increased, and the sales of the year increased thereby. Probably not less than half of the increase was made from stock carried over from 1904, with the result that stock now on hand in Florida reduced to the lowest point reached in six years.

Prices during 1905 were good, and on account of the rapidly increasing European demand, they promise to be even better in 1906. Buyers are already making contracts for 1907, and some are venturing to look as far ahead as 1908. The scarcity and increased cost of labor, and the greater cost of mining, check the response that otherwise might be made to the greater demand and higher prices. The prices obtained for high-grade phosphate rock during 1905 averaged from 25 to 50 c. per ton more than in 1904.

The producers of phosphate rock in Tennessee have shared in the general prosperity of the industry. The quantity of phosphate rock mined and sold in 1905 surpassed the production for 1904, (the previous banner year), probably exceeding 600,000 long tons as compared with 530,571 long tons for 1904.

Tennessee prosphate rock was sold at a higher average price for the year but little change was noted in the situation in South Carolina. The production of this State in 1905 showed a slight increase over that of the previous year.

Pig-Iron Production in 1905.

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in 1905. Reports of production have been received directly from every furnace in the country. At the request of many pig-iron makers the collection of unsold stock statistics has been abandoned by this association.

The total production of all kinds of pig iron in 1905 was 22,992,380 gross tons, against 16,497,033 tons in 1904, 18,009,252 tons in 1903 and 17,821,307 tons in 1902. The following table gives the half-yearly production in the last three years in gross tons:

	1903.	1904.	1905.
First	9 707,367	8,173.438	11,163,175
Second	8,301,885	8,323,595	11,829,205
Total	18,009,252	16,497,033	22,992,380

The production of 1905 was not only much the largest in our history, but it exceeded that of 1904 by 6,495,347 tons, or over 39 per cent. The year of next largest production was 1903, when 18,009,252 tons were made. The increase in production in 1905 over 1903 was 4,983,128 tons, or over 27 per cent.

The production of bessemer and low-phosphorus pig iron in 1905 was 12,407,116 tons, against 9,098,659 tons in 1904, an increase of 3,308,457 tons, or over 36 per cent. The production of low-phosphorus pig-iron alone in 1905 amounted to 186,907 tons, against 190,946 tons in 1904.

The production of basic pig iron in 1905, not including charcoal of basic quality, was 4,105,179 tons, against 2,483,104 tons in 1904, an increase of 1,622,075 tons, or over 65 per cent.

The production of charcoal pig iron in 1905 was 352,928 tons, against 337,529 tons in 1904, 504,757 tons in 1903, and 378,504 tons in 1902.

The production of spiegeleisen and ferro-manganese in 1905 was 289,983 tons, against 219,446 tons in 1904, an increase of 70,537 tons. The production of ferro-manganese alone in 1905 was 62,186 tons, against 57,076 tons in 1904.

One company produced 1243 tons of ferro-phosphorous in 1905, against a similar production of 946 tons in 1904. Another company reported a production of 2750 tons of ferro-bessemer in 1905, but did not report any iron of this grade in 1904. These figures are not included in the spiegeleisen and ferro-manganese reported above.

Classified by fuel used, there were 20,964,937 tons made with coke and bituminous coal—chiefly coke; 1,674,315 tons with anthracite, and 352,928 tons with charcoal.

The production by States for two years has been as follows, in long tons:

	1904.	1905.
Massachusetts	3,149	15,987
Connecticut	8,922	
New York	605,709	1,198,068
New Jersey	262.294	311,039
Pennsylvania	7,644,321	10,579,127
Maryland	293 441	332,096
Virginia	310,526	510,210
North Car., Georgia & Texas	75,686	38,699
Alabama	1,453,513	1,604,062
West Virginia	270,945	298,179
Kentucky	37,106	61,735
Tennessee	302,096	372,692
Ohio	2,977,929	4,586,110
Illinois	1,655,991	2,034,483
Michigan	233,225	288,704
Wisconsin and Minnesota	210,404	351,415
Missouri, Colorado & Wash.	151,776	407,774
Total	16,497,033	22,992,380

The whole number of furnaces in blast on Dec. 31, 1905, was 313, against 294 on June 30, 1905, and 261 on Dec. 31, 1904. The number of furnaces in blast at the

end of 1905 was larger than at the close of any year since 1891, when exactly the same number of furnaces were active.

The number of furnaces actually in blast in the second half of 1905 was 349, as compared with 334 in the first half. In 1904 the number in blast during the last half of the year was 297, against 295 in the first half.

On Dec. 31, 1905, there were 17 furnaces in course of erection and 3 furnaces were being rebuilt. Of the building furnaces 2 were located in New York, 4 were in Pennsylvania, 1 was in Tennessee, 2 were in Alabama, 3 were in Ohio, 2 were in Illinois, 1 was in Michigan, 1 was in Wisconsin and 1 was in Colorado. With the exception of the Michigan furnace all of these furnaces when completed will use coke or mixed anthracite coal and coke for fuel. The Michigan furnace will use charcoal. Of the 3 rebuilding furnaces one was in Pennsylvania, one was in Kentucky and one was in Ohio. When rebuilt all three furnaces will use mineral fuel.

Steel Production in 1905.

The American Iron and Steel Association reports that the total production of bessemer steel ingots and castings in 1905 was 10,941,375 gross tons, against 7,859,140 tons in 1904, an increase of 3,082,235 tons, or over 39%. The production in 1905 was much the largest in our history, greatly exceeding that of 1902, the year of next largest production, when 9,138,363 tons were made. Of the total production last year 10,920,591 tons were made by the standard bessemer process and 20,784 tons by the Tropenas and other modifications of the bessemer process. Acid bessemer steel only was produced in 1905.

The following table gives the production of bessemer steel ingots and castings in the last four years by States. Of the production in 1905 22,103 tons were direct castings, against a similar production of 16,051 tons in 1904.

States.	1904.	1905.
Pennsylvania	3,464,650	4,491,445
Ohio	2,050,115	3,131,149
Illinois	1,257,190	1,651,250
Other states	1,087,185	1,667,531
Total	7,859,140	10,941,375

There were no Clapp-Griffiths works in operation in 1905 and only 2 Robert-Bessemer plants were active. Twenty-five standard bessemer plants were at work, as compared with 24 in 1904, and 13 Tropenas plants were running, against 11 in 1904. In addition one plant made steel by the Bookwalter process and 4 plants made steel in special bessemer converters. All the small bessemer works make a specialty of castings, although ingots are occasionally made.

During 1905 three bessemer converters were abandoned and dismantled, two 5-gross-ton standard bessemer converters at Pittsburg and one 2-gross-ton Bookwalter converter at Reading, Pa.

While Pennsylvania is still far in the lead of other States as a producer of bessemer steel it will be noticed by the table that Ohio is fast looming up as a powerful competitor. When the new standard bessemer steel plant now being built at Youngstown is completed and put in operation Pennsylvania's present lead will be materially reduced.

Rails—The production of all kinds of rails in the United States in 1905, as ascertained by the American Iron and Steel Association, amounted to 3,372,257 gross tons, against 2,284,711 tons in 1904, an increase of 1,087,546 tons, or 47.6%. The maximum production was reached in 1905. The year of next largest production was 1903, when 2,992,477 tons were made. The increase in 1905 over 1903 amounted to 379,780 tons, or over 12%. Rails rolled from purchased blooms, crop ends, seconds, and re-rolled, or renewed, rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. The various descriptions of rails made in 1905 were, in long tons:

	Tons.	Per ct.
Bessemer steel	3,188,675	94.6
Open-hearth steel	183,264	5.4
Iron	318	....
Total	3,372,257	100.0

Of the total output of rails, Pennsylvania furnished 1,113,841 tons, or about one-third. Twenty-four plants in 12 States rolled or re-rolled rails in 1905, as follows: New York, 1; Pennsylvania, 5; Maryland, 3; West Virginia, 1; Georgia, 1; Alabama, 3; Ohio, 4; Illinois, 2; Wisconsin, 1; Colorado, 1; Washington, 1; and California, 1.

The production of bessemer steel rails in 1905 amounted to 3,188,675 gross tons, against 2,137,957 tons in 1904, an increase of 1,050,718 tons, or over 49%. Of the total, 1,095,154 tons were rolled in Pennsylvania. In addition to Pennsylvania the States which made bessemer rails in 1905 were New York, Maryland, West Virginia, Georgia, Ohio, Illinois, Wisconsin, Colorado, and Washington.

Of the bessemer steel rails rolled in 1905, a total of 3,135,729 tons were made by companies furnishing their own steel ingots; 52,946 tons were rolled by mills from purchased ingots. The total includes about 101,000 tons of renewed or re-rolled rails.

The total production of open-hearth steel rails in 1905 was 183,264 tons, against 145,883 tons in 1904, 45,054 tons in 1903, 6029 tons in 1902, 2093 tons in 1901, and 1333 tons in 1900. The maximum production of open-hearth rails was reached in 1905; the year of next highest production was 1904.

Alabama rolled almost all the open-hearth rails that were rolled in 1905 and 1904, Pennsylvania rolling the remainder in 1905 and Pennsylvania and Colorado in 1904.

The production of iron rails in 1905 was 318 tons, all rolled in Alabama, Ohio, and California, and all weighing less than 45 lb. to the yard. In 1904 the production was 871 tons.

The following table gives the production of all kinds of rails in 1905 according to the weight of the rails per yard. Street rails are included. The figures are in long tons:

	Tons.	Per ct.
Under 45 lb	226,580	6.7
Over 45 lb. and less than 85 lb.	1,599,624	47.4
85 lb. and over	1,546,053	45.9
Total	3,372,257	100.0

The noticeable point here is the increased proportion of rails over 85 lb. to the yard. Rails of 100 lb. are now used by many roads, while sections of 110 lb. and 125 lb. have been made for special heavy service.

Abstracts of Official Reports.

Utah Copper Company.

This company began active operation of its mine and concentrator July 1, 1904. Its first annual report covers the year ended June 30, 1905.

The orebody within the company's properties is a mass of copper-bearing, altered porphyry, the dimenisons of which, either with respect to the vertical or horizontal extensions, or its exact shape, have not yet been determined. Extensive development, however, has been going on from tunnels driven in the mountain sides as nearly as possible at the cañon level, one on the west side and one upon the east side of the cañon, which traverses the full length of the property.

No development has been done below the level of these tunnels, but above them mining has been planned in such a way as to permit the extraction of ore by what is known as the "caving system" until such time, at least, as it is deemed expedient to apply other and more economical means. Except to a very small degree, it has not been found necessary to waste any material whatever from the mine, everything encountered in development having been of a profitable working grade. Certain drill-holes have been made at various points in the property to a depth below the tunnel level, which indicate continuous orebodies of a profitable grade existing at very much greater depth, and while the developments at the present time have been very extensive, thy have not, as before stated, disclosed the limits of the orebody. What has been done, taken in connection with conditions which are apparent and the results of the drill-holes above stated, would indicate the existence of an enormous orebody.

The average assay of some 6000 samples, taken during the period referred to from the various portions of the mine under development, is so nearly identical with that of the average ore sent to the mill during the year that it can be stated that a fair average value of all ore de-

veloped is 1.98% copper, and the average assay value of gold and silver is 0.016 oz. and 0.15 oz. per ton, respectively.

The extraction of ore by stoping did not commence until November, 1904. Prior to that time practically all the tonnage treated by the mill was that extracted in the course of development, which naturally added largely to the cost of mining per ton, but was considered as a most desirable business procedure in disclosing the grade of the ore deposits.

It will be noted that the profit as shown on the balance sheet for the first year is the result of a year's operation largely devoted to developing the mine and to experimenting in the mill. It will be remembered that the mill, in the first instance, was erected and has been used largely as an experimental plant for the purpose of determining the most economical and feasible plan to be followed in larger operations, which are now under full progress.

The various and extensive experiments necessarily interfered to a considerable extent with the continuous operation of the milling plant and therefore reduced the actual number of tons treated considerably below the maximum capacity of the plant; but all of these experiments and the resulting expenditures have been made, as before stated, with the idea of directing the company in the construction of its new plant. From the results already obtained in practical operations at the present mill the first unit of 3000 tons per day of the new mill will be able to produce copper at 8c. per pound.

Since the close of the last fiscal year the company has authorized an issue of $3,000,000 6% convertible bonds, the proceeds of which will be expended in the retirement, on July 1, 1906, of the entire present outstanding bonds, amounting to $750,000 par value, bearing interest at 7% per annum, and in the construction of a mill capable of treating approximately 6000 tons of crude ore per day. The first unit of this mill, having a capacity of approximately 3000 tons per day, will be ready for operation, under contracts already made, by November, 1906, and it is expected that the second unit will be installed thereafter as soon as practicable, though the directors may conclude to begin the erection of the second unit before the beginning of operation of the first.

The operation of the present plant, located in Bingham Cañon and heretofore referred to as the experimental plant, together with the operation of the first unit, should result in a production of copper aggregating from 30 to 35 million pounds per annum, which will be correspondingly increased upon the completion of the second unit.

The Guggenheim Exploration Co. has become largely interested in the company and the services of John Hays Hammond have been secured as consulting engineer.

Notwithstanding the fact that the mill during the period referred to was conducted almost entirely as an experimental plant, and large outlays were made for mining development, the profits in operation amounted to $198,738, from which taxes and interest on bonds outstanding, aggregating $750,000 par value, which sums total $56,250, have been provided, leaving a net gain of $142,488 for the year.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week ended Jan. 30, 1906.

810,897. APPARATUS FOR PRODUCING COMPOUNDS OF TIN.—Charles E. Acker, Niagara Falls, N. Y., assignor to Acker Process Company, a Corporation of New Jersey. Filed June 8, 1903.

810,904. APPARATUS FOR GRINDING OR CRUSHING FOUNDRY-SAND, etc.—Philibert Bonvillain, Paris, France. Filed June 1, 1904.

810,910. WELL-SINKING APPARATUS.—Matthew T. Chapman, Aurora, Ill. Filed Nov. 14, 1901.

810,922. COAL-SCREEN.—Elza R. Dickey, Dugger, Ind. Filed Oct. 31, 1904.

811,003. TIE-PLATE FOR FURNACES.—Charles E Tudor, Cincinnati, Ohio, assignor to The Tudor Boiler Manufacturing Company, Cincinnati, Ohio, a Corporation. Filed Nov. 13, 1905.

811,006. CONVERTER.—George T. Walker, Washington, D. C. Filed Jan. 10, 1905.

811,029. TELEPHONE FOR SHIPS, MINES, etc.—Arthur F. Boardman, Somerville, Mass., assignor to Electric Gas Lighting Company, Boston, Mass., a Corporation of Maine. Filed April 10, 1905.

811,040. SINTERING COMMINUTED ORE OR FLUE-DUST.—George L. Davison, Chicago, Ill., assignor to American Sintering Company, Chicago, Ill., a Corporation of Illinois. Filed Nov 4, 1905.

811,079. STAMP-ACTUATING MECHANISM FOR ORE-CRUSHERS.—Walter S. McKinney, Chicago, Ill. Filed May 23, 1904.

811,085. PROCESS OF RECOVERING VALUES FROM SULPHIDE ORES.—Edwin C. Pohlé, Reno, Nev. Filed June 1, 1905.

811,097. APPARATUS FOR TREATING MOLTEN METAL.—Joseph S. Seaman, Pittsburg, Pa. Filed May 23, 1904.

811,110. APPARATUS FOR PUMPING LIQUID.—George L. Waterhouse, New York, N. Y. Filed June 13, 1905.

811,143. COMPRESSING STEEL IN CONICAL MOLDS.—Henri Harmet, St. Etienne, France. Filed Oct. 7, 1902.

811,144. HOISTING AND CONVEYING APPARATUS.—Judson Hayward, New York, N. Y. Filed Mar. 25, 1905.

811,192. SEPARATOR.—Freeman R. Willson, Jr., Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. Filed Nov. 20, 1901.

811,196. CYLINDER FOR TREATING HEATED METAL.—George H. Benjamin, New York, N. Y., assignor to The Coe Brass Manufacturing Company, a Corporation of of Connecticut. Filed May 18, 1905.

811,208. GAS-PRODUCER.—Carleton Ellis, New York, N. Y., assignor to Combustion Utilities Company, New York, N. Y., a Corporation of New York. Filed Mar. 15, 1905.

811,219. CRUCIBLE-FURNACE.—Ernst Hausmann, Cologne, Germany. Filed Aug. 19, 1905.

811,223. REFRACTORY WALL FOR GLASS-TANKS.—Leon J. Houze, Port Marion, Pa. Filed Aug. 7, 1905.

811,229. WATER-PURIFYING APPARATUS.—Cass L. Kennicott, Chicago, Ill., assignor to Kennicott Water-Softener Company, Chicago, Ill., a Corporation of Illinois. Filed Feb. 25, 1905.

811,239. MANUFACTURE OF NICKEL-COPPER ALLOYS.—Ambrose Monell, New York, N. Y. Filed Apr. 20, 1905.

811,274. SOLAR FURNACE.—Albert Carter, Los Angeles, Cal., assignor to Solar Furnace and Power Co., a Corporation of Arizona. Filed Jan. 6, 1904.

811,275. DREDGING APPARATUS.—James P. Cole, Chicago, Ill. Filed May 26, 1905.

811,348. FISHING-TOOL FOR OIL-WELLS. Abram W. Wolf, Amos, W. Va. Filed Sept. 25, 1905.

811,425. COALING DEVICE FOR MOVING TRAINS.—Charles M. Miller, Tyrone, Pa. Filed July 3, 1905.

811,433. CALCINATION OF HYDRATED ALUMINA.—Alfred R. Pechiney, Salindres. France, assignor to Compagnie des Produits Chimiques d'Alais et de la Camargue, Lyon, France. Filed Apr. 3, 1905.

811,486. TIPPLE.—Charles R. Connor, Ensley, Ala., assignor of one-half to William D. Caldwell, Ensely, Ala., and one-fourth to John W. Wikes, Jefferson county, Ala. Filed Jan 4, 1905.

811,522. TREATING MOLTEN METAL.—Joseph S. Seaman, Pittsburg, Pa. Original application filed May 23, 1904.

811,532. PNEUMATIC STACKER.—Henry J. Daws, Hopkins, Minn., assignor to Severin N. Sorensen, Minneapolis, Minn. Filed Feb. 6, 1904.

Reissues.

12,441. EXCAVATING-MACHINE.—Charles C. Jacobs, Amboy, Ill., assignor to The Jacobs' Steel Excavator Company, Amboy, Ill., a Corporation of Illinois. Filed Dec. 26, 1905.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ended Jan. 20, 1906.

25,204 and 25,204A of 1904. SULPHIDE SEPARATION.—A. P. S. Macquisten, Glasgow. This invention relates to the separation of metallic sulphides from gangue by flotation. The inventor uses a traveling belt which continuously passes into and out of water. As the belt goes into and out of the water, the particles of sulphide are floated off, leaving nothing but gangue on the belt.

28,433 of 1904. PRODUCTION OF CAUSTIC ALKALI AND PURE ZINC SULPHIDE.—H. W. de Stuckle, Dienze, Germany. The inventor produces caustic alkalis and a particularly pure sulphide of zinc suitable as a pigment by the reaction of zinc on an alkali sulphide in presence of caustic alkali.

1,697 of 1905. FINES CONCENTRATING TABLE.—G. F. Wynne, Wrexham. A concentrating table suitable specially for fine ores. The ore is fed on-to a stationary table and carried along it by a number of rubber scrapers. The water runs down the table transversely to the travel of the scrapers and washes off the gangue.

4,076 of 1905. ELECTRIC WELDING.—The Thomson Electric Welding Co., Lynn, Mass. An electric welding plant; intended for welding fine wires, the improvements introduced being for the purpose of making the action automatic and of regulating to a nicety the amount of pressure employed.

5,465 of 1905. BLAST FURNACE CHARGING APPARATUS.—A. Sahlin, London. An improved blast furnace charging apparatus consisting of an upper receiving hopper, a distributing spout and a lower revoluble hopper.

8,281 of 1905. COAL AUGER.—F. H. Waterhouse, Wakefield. In coal drills mounted on a travelling frame and operated by electricity or other power, improved devices for adjusting the height and angle of inclination of the drill.

10,476 of 1905. MINE CAR BUFFERS.—R. J. Foster and G Milnes, Sheffield. Improved central buffers and couplings for ore wagons.

23,097 and 23,098 of 1905.—TANTALUM FILAMENT.—Siemens and Halske, Berlin. A method of producing wires suitable for incandescent electric lights made from a tantalum alloy. The inventors first make a fine wire of tantalum which is specially suitable for drawing into wire form and then precipitate on its surface the other metal such as osmium, molybdenum or tungsten, which are not ductile, subsequent heating to a high temperature cause the metals to alloy together.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Walter Hayes Bunce has been in New York on professional business.

Albert Roberts has been examining mining properties at Hailey, Idaho.

J. C. Drury, a well-known British Columbia mining man, is in Montreal.

Martin Schwerin, of New York, is in Oregon, examining some mining properties.

N. Jorpland will have charge of the Canadian Northern railway coal docks at Port Arthur.

George L. Mackenzie passed through New York last week, on a professional trip to the West.

J. M. Hillyer is making an examination of the Florence iron belt, in the State of Michoacan, Mexico.

Victor Nordberg, of the Nordberg Manufacturing Co., of Milwaukee, is passing a few days in Butte on business.

H. R. Sleeman left London on Jan. 26 for West Africa, where he will take over the management of the Obenemasi mine.

Edward Hooper has returned to London from his visit to the Great Boulder Perseverance mine at Kalgoorlie, Western Australia.

G. B. Waterhouse has been appointed metallographist to the Lackawanna Steel Co. and will have his office at Buffalo, New York.

C. L. W. Little, of Boston, Mass., is investigating the gold fields of Central America, and is paying particular attention to Costa Rica.

John J. Broughall, who is mining in Utah and was for many years connected with various mining companies in Butte, Mont., was in Butte recently.

W. S. Mann, engineer for the Montezuma Mines, Inc., of New York, has gone to Costa Rica, Central America, to start construction on their new mill.

W. E. Condon, of San Francisco, is now engaged in locating the new Bay Counties railroad from San Francisco north. His city office is temporarily closed.

J. M. Callow has gone to Europe on professional business. He expects to be back at his headquarters in Salt Lake City, Utah, about April 1 next.

C. W. Pritchett, of Denver, Col., returned there a few days ago from a three months' trip in Mexico, and will in a few days leave for New York and Boston.

George T. McGee, formerly superintendent of the Butte & Boston mines, has been appointed to a similar position with the Butte Copper Exploration Co., operating in Butte.

W. Thibaudeau, Dominion engineer at Dawson, has returned to Ottawa and will report to the government on the project for an adequate supply of water for mining purposes.

John M. Cameron has resigned his position as superintendent of the Anita Copper Co. at Williams, Ari., to take a similar position with the Growler Copper Co. at Gila Bend, Arizona.

Alfred James has left London on a professional visit to Australia. His address for the next few months will be care of the Consolidated Gold Fields of New Zealand, Reefton, New Zealand.

Alexandre Bonnin, of the technical department of the Comptoir National d'Escompte, Paris, France, was in Toronto this week in the course of a tour of investigation of Canadian mining and metallurgical conditions.

Charles S. Bradley, practicing electrician of New York, known for his contributions to electricity and chemistry, has been elected acting professor of chemical practice in the Carnegie Technical Schools, Pittsburg.

Guy C. Holtz has withdrawn from the firm of Holtz & Locke, mining and metallurgical engineers, with office in Salt Lake City, Utah, to accept the position of assistant superintendent of the Corinthian Mines Co., at Esparto, Costa Rica.

Fred W. Sherman, superintendent of the Daly-West mill in Park City, Utah, spent a few days in Butte recently. He is placing machinery in the new mill of the Green Campbell Co., operating at Silver Star, Madison county, Montana.

Leslie Hill, of Nelson, B. C., has been at Silverton, B. C., making an examination of the Hewitt and Lorna Doone mines. He has now gone east on business connected with his companies, and will meet some of the directors in New York.

T. W. Guthrie, who for some months has been secretary of the executive committee of the Republic Iron & Steel Co., has been made assistant to President John A. Topping, with jurisdiction over mines, coking plants and transportation of ore.

T. J. Bray, for the past five years chief engineer of the United Engineering & Foundry Co., Pittsburg, has been appointed assistant to President John A. Topping of the Republic Iron & Steel Co. Mr. Bray will make his headquarters in Pittsburg.

W. H. Storms, the well known California mining engineer, has resigned his position as editor of the *Mining and Scientific Press*, of San Francisco, and contemplates resuming practice as a consulting engineer. He will open an office in Berkeley, California.

Frank D. Adams, professor of geology in McGill University, Montreal, has been awarded the Lyell medal by the Geological Society of London, Eng. Dr. Adams is the second Canadian to receive this honor, the medal having been given in 1881 to Sir William Dawson.

Henry A. Allen has established an office as consulting engineer in the First National Bank Building, Chicago. He has had extensive experience with pumping and other plants, having been in the United States navy, with the Western Electric Co., the Allis-Chalmers Co. and in other responsible positions.

Wilber H. Traver, formerly connected with the Rand Drill Co., has severed his connection with the Ingersoll Rand Co. and accepted service with the Chicago Pneumatic Tool Co. as manager of the mining and contract department. Mr. Traver will devote his time and attention principally to the sale of air-compressors, rock drills and mining machinery.

Obituary.

Charles Newman, one of the prominent and early mine-owners in Southwestern Colorado and formerly senator from La Plata county, died at Durango. Colo., on Jan. 31, of pneumonia.

Henry M. Lewis, president of the S. S. White Dental Manufacturing Co., died at his home in Philadelphia, Jan. 26. He had been connected with the company for a long time. He was a high authority on the production and uses of platinum, having made careful studies on these points for a number of years.

Hermann Johann Philipp Sprengel, Royal Prussian professor, who died suddenly at his residence in London, Jan. 14, was 72 years of age, and had had a distinguished career. He was the first to discover the value of picric acid as an active explosive agent. It is now used under various names, lyddite and melinite being the best known.

Alexander McKay, one of the best known mining men of the States of Durango and Zacatecas, Mexico, died at Nombre de Dios on the night of Jan. 12. At the time of his death he was returning to Chalchihuites from Durango, and being taken sick on the road, he was carried to Nombre de Dios, where he died a few hours later. Mr. McKay had been 25 years in the republic, and before coming to the country he was engaged in mining in Colorado and Nevada. He was one of the owners of the Eureka mine at Chalchihuites, besides having worked in several of the best known mines of Durango. Mr. McKay was 56 years of age and was born in Nova Scotia.

Thomas Wilson, Sr., who opened the first coal mines of any consequence in southern Indiana, died recently at his home in Washington, Ind., 86 years old. He was born in Manchester, England, 1819, and worked as a miner there until he came to Washington in 1857. A few years prior to his arrival the construction of the old Ohio & Mississippi, now the Baltimore & Ohio Southwestern, had ex-

posed the fact that a rich coal vein lay under the farm owned by William S. Turner. No one in that section of the State knew anything about mining in those days, and only sufficient coal was mined for the blacksmiths. The railroad started a boom for Washington, and when Wilson arrived, although penniless, he secured a contract with Turner for mining the coal. In three years he had accumulated sufficient money to buy the land, and by his persistent energy and ability when he retired from active business in 1885, he held property worth $200,000. In 1886 he organized a mining and mercantile company with his sons, who managed the business. The company sold its interests in 1900. During his years of active mining he never suffered from a strike among his men.

Societies and Technical Schools.

American Electro-chemical Society.—This society tendered a reception to Prof. Wilhelm Ostwald, at the Chemists' Club, New York, on Feb. 2. Among the speakers were: Prof. Bancroft, president American Electro-chemical Society; Prof. Chandler, American Chemical Society and Society of Chemical Industry; Prof. Loeb, Prof. Ostwald, Dr. Schieffelin, president of Chemists' Club, and Prof. Wiley.

Trade Catalogs.

John A. Roebling's Sons Co., Trenton, N. J. The Roebling soldered rail bond; pp. 24, paper, 6 by 9 in.

Northern Electric Mfg. Co., Madison, Wis. Bulletin No. 32, Northern steel crane motors; pp. 16, paper, 7 by 10 in.

Comstock Engine Co., 49 Clymer St., Brooklyn, N. Y. Booklet, Graphoil lubricators; pp. 8, paper, 3½ by 6½ in. 1906.

Allis-Chalmers Co., Milwaukee, Wis. Bulletin No. 1202. The Reliance friction clutch; pp. 4, paper, 8 by 10½ in.. 1905.

The Weber Gas & Gasoline Engine Co., Kansas City, Mo., issues a catalogue and numerous flyers describing its various products.

The Cyanide Plant Supply Co., 1 Broad St. Place, London, E. C. Supplement No 13. The plants of the world; pp. 64, paper 6 by 8 in. Dec., 1905.

The M. C. Bullock Manufacturing Co., Chicago, Ill., issues catalogues No. 42 and 44 describing hoisting machinery and mine ventilators, respectively.

Westinghouse Electric & Mfg. Co., Pittsburg, Pa., Circular No. 1107; Automatic circuit-breakers, carbon break pp. 19, paper. 7 by 10 in. Dec. 1905.

The Green Fuel Economizer Co., Matteawan, N. Y. Bulletin 101, Air heaters; pp. 8, paper, 6 by 9 in. Booklet, Steel plate fans, blowers and exhausters; pp. 16, paper, 3½ by 6 in.

United Iron Works, 32 Freemont St., San Francisco, Cal., Folder 25; Eclipse pumps, pp. 10, paper, 6 by 9 in. 1905 Folder No. 27; French's automatic excavator; pp. 10, paper, 6 by 9 in.

Freeman & Wolf, Zwickau, Saxony, issue a special catalogue of mine safety lamps. This may be obtained by application to their American agent, the Fidelity International Agency, 621 Broadway, New York.

The Wellman - Seaver - Morgan Co., Cleveland, O., issues "What We Do," a flyer giving a list of its products, and several elaborate catalogues descriptive of each class of work, from hoisting engines to hydraulic plants.

The Chicago Pneumatic Tool Co. issues a series of bulletins and catalogues. Those of most interest to mining engineers are No. 18, describing rock drills; No. 17, describing general pneumatic tools and an extra edition of their "Compressors."

Industrials.

The Bucyrus Co., Milwaukee, Wis., has let a contract to the Indiana Bridge Co., of Muncie, Ind., for a steel building 145x300 ft., to be used as a steel foundry.

The Solvay Process Co. of Syracuse, N. Y., in undertaking the enlargement of its power plants at Syracuse and Detroit, has placed orders for three new gas compressors, with the Allis-Chalmers Co., of Milwaukee. Two of the new units are for installation at Syracuse and one at Detroit.

The Virginia Iron, Coal & Coke Co., of Bristol, Va.-Tenn., recently purchased another 44 and 84 by 60 in. vertical standard, long crosshead furnace blowing engine for installation at Radford furnaces, Radford, Va. The new engine will be furnished by the Allis-Chalmers Co., Milwaukee, and will be ready for operation in May.

The Westinghouse Electric and Manufacturing Co. has recently closed a contract with the Southern Power Co. at Charlotte, N. C., for a large and complete power equipment consisting of eight 3000-kw. water-wheel type alternators, with a complement of transformers, exciters and switchboards. This is the largest contract for electrical apparatus placed in the South for some years.

The increasing business of the H. W. Johns-Manville Co., has necessitated the establishment of two new departments at their head offices in New York. One of these is the railroad department, devoted to railway supplies. The other is an export department, under the management of William Angevine, in order to facilitate the handling of the foreign business of this company. They are building up a large and growing business with the Spanish-American countries in particular.

The Westinghouse Machine Co., of East Pittsburg, Pa., has received during the past two months, many orders for Westinghouse-Parsons steam turbines. The largest orders were received from the transit Development Co., Brooklyn, N. Y., for a 7,500-kw. turbine; Edison Electric Co., Los Angeles, Cal., for a 7,500-kw. turbine; the Laclede Power Co., St. Louis, Mo., for two 2,000-kw. turbines; the Mt. Whitney Power Co., Visalia, Cal., for a 1,000-kw. turbine. This company has also received numerous orders for Roney mechanical stokers.

A large order for oil engines has recently been awarded to the De La Vergne Machine Company, New York, by Burnham, Williams & Co., Baldwin Locomotive Works, Philadelphia. This is for engines aggregating over 3300 actual h.p. Some of these are to be installed in Philadelphia and the remainder at the steel works at Burnham, Pa. The installation will consist of 125 and 250 h.p. Hornsby-Akroyd oil engines, and they are to be used for direct connection to electric generators to air compressors, while others will be used for operating machine tools by belt.

Construction News.

Georgel, Wise County, Virginia—The Crane's Nest Coal Co. is preparing to let contracts for building 150 coke ovens. H. H. Hardaway, Georgel, is in charge.

Clifton, Arizona.—The Sierra de Oro Mining Co. is preparing to put in a mill, as soon as its tunnel is completed; the latter is now well advanced. Mr. Dell M. Pattes, of Clifton, has charge.

Idaho Springs, Colorado.—G. S. Stevens, manager of the Metropolitan mine, near Idaho Springs, Colo., has been instructed by Philadelphia and New York operators to install an electrical plant of machinery.

York Gulch, Colorado—Sternberger Bros. of Idaho Springs, Colo., are figuring on the erection of a mill to cost about $10,000, for the treatment of zinc ores in their property in York Gulch, Clear Creek county.

Butte, Montana—The Washoe Copper Co. has contracted with the Allis-Chalmers Co., of Milwaukee, for the delivery of four large electric induction motors for use in the Washoe plant in Anaconda. The motors are to be delivered as soon as possible.

Wall Street, Colorado.—The Tambourine mine of the Gold Run Mining Co., at Wall Street, has been sold to Colorado Springs people. They will develop with a tunnel and are figuring on the installation of machinery. E. A. Austin, of Boulder, is president of the company.

Georgetown, Colorado. — The Scotia Co., of which W. P. Jewell, of Georgetown, Colo., is manager, is going to erect a mill to treat the product of its mines.

The Linn Consolidated Mining Co., of which W. C. Hood, of Georgetown, Colo., is manager, is going to enlarge its 25-ton mill to a plant of 100 tons capacity.

Tintic, Utah—The Yankee Consolidated Mining Co., L. A. Amsden, McCornick bank building, Salt Lake City, manager, will be in the market for a milling plant in the near future. The mill is to be built in the Tintic, Utah, district and will treat low grade ores from the Yankee Consolidated mine.

Butte, Montana—Secretary Packard, of the Columbus-Butte Mining Co., operating in Butte, has instructed Ed. Higgins, Jr., superintendent of the property, to furnish him with estimates for machinery capable of sinking the shaft to a depth of 1200 ft. Communications should be addressed to Mr. Higgins, 901 West Copper street, Butte.

Leadville, Colorado — The Damascus Mining & Milling Co., operating on the Mosquito range, is erecting a mill in the lower part of the city which will be supplied with seven Blake-Morscher electrostatic separators, with a capacity of from 10 to 15 tons each daily. The mill will be supplied with automatic rolls and crushers, and in addition to treating its own ores will be a custom mill. A switch is being put in by the Denver & Rio Grande road on the upper side of the mill. The mill will be in running order by the end of February.

Butte, Montana—A Butte despatch says that a fire, of unknown origin, partially destroyed Senator W. A. Clark's Butte reduction works, January 31. The fire started about midnight and resisted all efforts of the firemen until it had enveloped the concentrator building and the large elevator used for conveying concentrates. Later the firemen gained control, saving the engine-house, with valuable machinery, and the smelter plant. A. H. Wethey, local manager for Senator Clark, estimates the loss at $500,000, only partially insured. The plant will be rebuilt as soon as possible.

Madoc Township, Ontario.—The British American Development Co., of Toronto, which is operating a pyrites mine near Queensborough, Madoc Township, Ont., has a shaft down 100 ft., and has begun drifting on ore bodies. The company has found it necessary to increase its plant, and is preparing to install a 5-drill air compressor and hoisting engine, and is also erecting storage buildings. The company is arranging with the Bay of Quinté Railway Co. to run a switch to the mine. When the new plant is complete the company will be able to ship two car-loads of ore per day. The company's address is 5 Mail Bdg., Toronto, Ontario.

Special Correspondence.

Butte. Jan. 31.

In the production of copper, 1905 was a prosperous year for Butte. Figures showing the exact quantity of metal turned out of the smelters are still lacking, but it was certainly very large. Amalgamated, United Copper, North Butte and the Pittsburg & Montana Copper were the producers, but the latter did not begin until late in the year. It is now making between 6 and 7 tons a day. Raven and Reins mined some copper ore, but not enough to increase the total very much. Both will undoubtedly enter the producing class on a fair scale within a few months, especially Raven, which is driving a crosscut from the 1500-ft. station of the Buffalo to cut its three veins in Snoozer ground. Reins spent the larger part of the year in development work and will not finish what it has on hand until the middle of the year. Barring accident, this year will be a much better one than 1905, for Amalgamated is mining and treating more ore than ever. Its daily shipments to the Washoe plant aggregate 7,800 tons, of which 7,500 come from its own mines and 300 from small properties in the district. Boston & Montana is sending 112,000 tons a month to Great Falls.

Considerable sinking was done during the year 1905; a total of 200 ft. was added to the shaft of the Anaconda; 406 to the Neversweat; 122 to the St. Lawrence; 200 to the West Steward; 200 to the Original, and 200 to the West Colusa. Besides sinking, the Anaconda crosscut its main vein on the 2200 and is now driving for it 200 ft. deeper. As to the width of the vein on the 2200, but little is known outside the company. It is said to be 50 ft. and all good ore. The cutting of the vein at this point has been classed as a strike. The company knew it was where it was cut and knows it will cut it 200 ft. deeper.

Boston & Montana began extensive improvements early in the year and will complete them this year. It is making a new 1200-ft. shaft on the Leonard and will equip it with a new Nordberg hoisting engine and steel gallows-frame. The work has not interfered with the operation of the mines, the ore of which is raised through the Leonard. The Mountain View was equipped with a new engine and the boiler capacity increased.

United Copper mined and treated between 1100 and 1200 tons of ore per day. Its producers were the Rarus, Cora, Minnie Healey and Belmont. The latter does not call for much. The company is operating the Lexington on a small scale between the 500 and surface, but the Montana Zinc gets the bulk of the output. The Cora has been equipped with a new engine. United Copper takes all the ore it can get in the open market.

W. A. Clark mined and treated an average of 900 tons of ore a day in 1905, the entire lot coming from the Steward the Original mines, both of which are 2000 ft. deep and contain good veins of medium and high-grade ore. Each shaft was sunk 200 ft. Extensive improvements were begun at his reduction plant, but are not yet finished. Converters are taking the place of blister copper furnaces and machinery for re-grinding the tailings has been added; also several concentrating tables. The concrete-steel stack, 352 ft. high, was finished in November, and the connections between it and the furnaces are now being built.

North Butte came into existence last summer, its promoters buying the Speculator Co.'s ground for $5,000,000. Since then it has increased its possessions materially, re-timbered the old shaft from top to bottom, 1600 ft., and ordered a new hoisting engine and steel gallows-frame, both of which are due. During the time the shaft was undergoing repairs the output of the property was about 550 tons a day, but prior to that and since then up to last Wednesday it aggregated between 700 and 800 tons. One side of the old engine was wrecked by the breaking of a clutch band three days ago, entailing a damage of $2000. The company is now hoisting its ore through the shaft of the High Ore, an Amalgamated mine. It expects to have the damage repaired a week hence. The company came into possession of the Berlin group of claims two weeks ago and suspended operations on the property without delay. The Berlin company had a shaft down nearly 400 ft. North Butte will explore the ground from its deep workings.

Since early fall the mines of the Pittsburg & Montana Copper have been yielding ore steadily and promise to continue for an indefinite period. The smelter, which at present contains only one blast furnace and one converter in operation, is being worked night and day. The company began sinking a third shaft last fall, but has concluded to let this work go for the present. Its veins, of which it has several, are holding their own in size and mineral contents. The company is making regular shipments of copper, made by the Baggaley process. Oscar Rohn is now in charge of the property, having succeeded Mr. Baggaley. The latter holds a third of the stock and says he has not sold any of it.

Toward the latter part of the year some new companies were organized to operate in Butte and some have been organized in the new year. The East Butte was first to enter the field. Then came the American Copper, or Coram syndicate, with a capitalization of $150,000,000. The latter was followed by the Butte & London Exploration Co. with a capitalization of $5,000,000 and 1,000,000 shares of stock. The latest in the field is the Butte

Copper Exploration Co., which was organized this week with a capitalization of $500,000 and 100,000 shares. It purposes to work the Six O'Clock group of eight claims on the east side. It is placing machinery on the property and will begin sinking as soon as possible. There is a shaft 440 ft. deep on the Six O'Clock and a lot of 3% copper ore in the Golden Chief, one of its claims. The officers of the company are: President, E. A. Nichols, of Butte; vice-president, A. F. Leopold, of Chicago; secretary and treasurer, N. Bruce McKelvie, of Boston. These men and Thomas S. Dee, Frank E. James and Spencer R. Hill, of Boston, and Warren Nichols, of Chicago, comprise the board of directors.

The Columbus-Butte Co. began operating the Jennie Dell group of claims in Butte, September. It is composed of Columbus, Ohio, and Butte men. Last week it struck a 9-ft. body of gold-silver ore that averages $100 a ton. It has been opened in two places and a crosscut is being driven for a third. Superintendent Higgins estimates the value of the ore in sight at $72,000. The company was organized with a view of going after copper. Some copper ore has been found in the vein. This is regarded as one of of the important silver-gold ore discoveries in the district. The company is working at a depth of only 450 ft. on an incline.

Aug. 1, 1905, the Granite-Bimetallic Co., operating in Philipsburg, Granite county, suspended operation finally. Since then it has sold its electric power plant and water supply to the Amalgamated, and its machinery to others, United Copper getting the hoisting engine for its Cora mine.

The Southern Cross mine, a gold producer, has yielded $260,000 during the last 18 months, not being operated continuously. The property is owned by a company, and has a new mill, which will be started up in a month or six weeks. C. V. Wisner, manager of the Montana Zinc property, has an option on 200,000 shares of the stock representing the interests of Lee Mantle and Henry L. Frank, of Butte.

Bisbee. Feb. 1.

Contracts have been made by the Mitchell Smelting Co. and the town of Naco, under which the company is to at once erect its 250-ton smelting plant there The initial expenditure will be about $75,000, and the full plant will not be completed for some time. There was a deal for the transfer of the properties of the Naco Improvement Co. to the Mitchell Co., but this fell through. The smelter will occupy a large space just east of Naco proper and on the international boundary. Naco is the place from which, before the Cananea road was built, the freighters started out for the Greene properties. There is abundance of water and a smelter there will draw from a considerable area in northern Sonora, as soon as contemplated extensions of the Cananea, Rio Yaqui y Pacifico road are completed. This will be the only custom smelter in this part of the State or Sonora, except for the Queen, which is not primarily a custom plant.

An important examination of the Empire State mine, close to the Modern, is being made by men from Utica, who are interested and who will put up what money is needed to carry the enterprise through, if they are satisfied.

The Copper Queen Co. will build a precipitating plant on the site of the old Bisbee smelter, to treat mine waters of the Czar shaft. It has been found that this water carries some copper in solution and launders will be put in and filled with scrap. The greater part of water pumped in this camp is free from acid, and will be wasted. The camp as a whole is pumping now about 6,000 gal. a minute, the greater part of which still comes from Briggs and Junction shafts of the Bonanza circle group. Briggs last week increased its pumping to nearly capacity, but that was when there was both sinking and work in the station, and the area of openings was materially increased. The sinking is now stopped, for the shaft has reached its depth. Junction is still pumping about the same volume of water as for many weeks, about 1,000 gal. per minute. The greater share of the camp's mine water is flumed to the Naco flat and used by the Bonanza circle ranch, where nearly 1,000 acres of desert have been reclaimed.

Hoatson shaft of the Pittsburg Co. is dropping about 5.5 ft. daily without interruption. The material met with of late has been leached lime carrying some black sulphide in small quantity, some iron and some carbonates, and it has been working back into lime within a day or two. It is down 970 ft., and it has been decided to sink to the 1,100 before drifting. The Ormond drift from Junction is still driven in, though not in ore. The impression is that this drift is too high to get much ore, and is being driven for information as much as anything.

Lowell shaft of the Copper Queen, is to be dropped 200 ft., to the 1,300-ft. level. While all the drifts and workings around this shaft are not in ore, they all look well and the mine is making a fine production of ore running up to 20% copper, and better occasionally. Lowell is making some water, and is draining the ground immediately surrounding it; with 200 ft. greater depth it will keep Hoatson shaft dry as a bone for a long time to come,

Black Mountain, across the line, is delayed and will not be saving gold for a month. Its cyanide plant cannot well be ready before May. The company has its annual meeting in a few days at Tucson, and the recent changes in the directorate will be continued for the coming year. The mine is looking very well, and it is claimed that it has now three times the ore reserves that were in sight when Messrs. Moore, of St. Louis, and Banks, its manager, made their reports, a year ago. There is little doubt that at the annual meeting an important increase in the stamping capacity will be authorized.

Silver Bell camp, where the Imperial Copper Co. is working, is getting a very unenviable reputation, and the sheriff has detailed more officers there. The mine is hoisting about 100 tons of ore daily, and smelter returns are 500,000 lb. per month. It is to erect a 300-ton smelter at Red Rock, on the main line of the Southern Pacific road. This company was financed by the same interests, at Saginaw and New York, that are back of the Tombstone Consolidated, under its reorganization.

The Copper Queen, at its Douglas mixing beds, is to add a second Thaw steam shovel, for loading the charging buggies. The smelter has blown in No. 1 furnace, out of commission for a while on account of a shortage of fuel, and the product for February will be up to average. The company has driven a well 1,200 ft. deep at Douglas, in the hope of getting artesian water for the smelter, and did get a flow of 200 gal. per minute at the depth of 400 ft. but nothing greater, and no more water at all below that depth.

Diamond drilling has commenced on the American Development Co.'s ground. The drill has been set near the center of the property, in line with the two easterly drill holes on Junction, and will bore vertically.

Junction has just received from the Nordberg company, of Milwaukee, Wis., a splendid fast hoist for its deep shaft, and the same will be set up soon.

Tonopah. Feb. 2.

The manager of the Montana-Tonopah reports that during the past three months there have been hoisted 2936 mine cars of shipping ore, 588 cars of mill ore, or third class, and 10,693 cars of waste. Total, 14,217 cars. New machinery has been ordered and is now under course of construction at factories. It consists of a 60-ft. steel gallows-frame, 12-drill Ingersoll-Sergeant compressor, 250-h.p. motor and 30-h.p. transformer to drive same, and a double drum, double cylinder, 15 by 18 in. hoist and 12 new cars. The approximate cost of installing will not exceed $35,000.

The Tonopah Mining Co. has secured control of the Nevada Copper Co., organized to operate the Dunlap copper mine, situated in the Pilot range of mountains, on the Southern Pacific railroad, about 65 miles north of Tonopah.

A strike of rich ore has been made in the 560-ft. level of the Midway. Some months ago a body of bonanza ore was encountered on the 435-ft. level. This shoot, about 8 ft. wide, has been drifted on

for over 300 ft., with average values across the vein running from $125 to $200, while streaks run as high as $4000 to the ton. The vein is an extension from the Montana. Drifting has of late been going forward at a further depth of 125 ft. and the striking of the new orebody in place is an important event in the history of the mine. Upward of $3,000,000 worth of ore was previously estimated as the amount in sight, and this figure will now be added to rapidly.

The Diamondfield-Blaek Butte Consolidated Co. shipped ore valued at approximately $45,000 last week. The Wallace lease on the Florence, near the famous Reilly, is in ore and will be a rival to greatness with the Peer & Pugh lease, adjoining.

The building for the new Dwight & Laughlan mill at South Bullfrog townsite is nearly completed and the machinery will be immediately moved in.

The Las Vegas & Tonopah railroad is building from Vegas toward Beatty at the rate of one mile per day. The rails are laid to Tule Springs, 13 miles from Las Vegas, and the graders are nearly to Indian Creek, 45 miles from Las Vegas. Subcontractors are scattered 20 miles along the route, working at different points. About 300 men are employed on the line. Trains follow the graders as closely as posible carrying ties, rails and other material.

Goldfield. Feb. 3.

There is considerable excitement in Goldfield at present on account of the recent strikes made at Manhattan, the new camp located 50 miles east of Tonopah. It is reported that Manhattan already has about 2000 inhabitants, and more are rushing in as fast as they can be accomodated by the teams and automobiles now on the road. Large freight teams daily leave Tonopah and Goldfield for the new camp; the freight rate from either point is 3c. per pound. A few days since a 20-horse team left here, carrying a large vault for the branch of the State Bank and Trust Co., which will be opened in Manhattan.

The January mine in Goldfield is shipping a large dump of low-grade ore to the smelters through the Columbia Sampling Works. As there are several custom mills in Goldfield, it seems that an exceptionally low rate has been made by the smelters in order to compete with the local mills. The January is now installing an electric hoist, and until this is in place underground operations will be discontinued. As the hoist and all the machinery are now on the ground, the change will not involve any great delay. It is stated that the company also proposes sinking a new working shaft, the main shaft at present being too small in proportion to the output of the mine. When all is in readiness the mine will be worked on a larger scale than ever.

The Combination mill is running steadily on ore from the Combination mine. The 10 new stamps which were recently added to the equipment are now ready for action. Three new Frue vanners, a Wilfley table and several new cyanide vats have been added so that the mill has now double its former capacity. A Chilean mill has replaced the Huntingtons, which were formerly used to re-grind the product of the stamps. A tube-mill is now on the ground awaiting installation, and will be placed in position as soon as convenient. Electric power is used throughout the mill, although the steam plant is retained as an auxiliary in case of accident to the electric power line.

The new hoist on the Diamondfield Triangle is now in working order, and is very satisfactory to the management of the property. The Triangle shaft is now down 100 ft. and drifting is in progress on the 70- and 100-ft. levels. Now that the new hoist is running further sinking will proceed at once.

The Mohawk property, which adjoins the Red Top on the west side, recently struck ore on No. 2 claim. Leasing is now progressing in the locality with renewed activity.

A local paper states that a 200-ton automatic sampler is to be erected here by Nelson Bros., who have been in the assaying business here for some time. It is the idea of the parties concerned to have the plant up-to-date in every particular. The sight for the proposed sampler is not mentioned; but it is said it will be as handy to the mines as possible without being too far from the railroad.

A crew of men is now at work in the Frank mill making some slight alterations in the cyanide department. As soon as the work is completed it is understood the mill will start up with three shifts.

San Francisco. Feb. 2.

Another merger of dredging companies has occurred in the Oroville field, by which the Feather River Exploration Co. and the Cherokee Dredging Co. combine with a paid-up capital of $1,500,000, under the title of Feather River Exploration Co. There are six dredges in operation on the two properties, and two more are to be built; and the lands comprise over a thousand acres of dredging ground. The directors of the new company are E. J. De Sabla, William H. Crocker, Frank G. Drum, Joseph D. Grant, Louis Sloss, John C. Coleman, Henry Butters, and W. P. Hammon, who will be general manager, with offices in San Francisco. John J. Hammon, the present superintendent of the Feather River Co., will continue in his position. Mr. Hammon is now general manager of several dredging corporations. By the last merger the companies formerly operated by New York and Pittsburg capitalists come under control of California men.

Now that the city of Oroville has been incorporated the council has passed an ordinance which prohibits any mining for gold within the city limits by the dredge process on pain of a fine of not less than $25 nor more than $300, or by imprisonment for not more than three months, or by both fine and imprisonment, at the discretion of the court. Contrary to expectation, the dredge-men made no concerted protest against the pasage of the ordinance. Only one dredge-man appeared and he wished to work a certain tract. The members of the City Council, James H. Leggett, who is operating a dredger on the Gardella tract, within the city limits, and a number of interested property-holders in that district met on the grounds and talked the matter over. Leggett proposed that if he be allowed a space 100 by 300 ft. to turn his dredge around in and back off the ground he would desist from any further work within the city limits. This proposition was agreed to by all concerned. This is no doubt a forerunner of an amicable adjustment of the difficulty all around.

In the Grapevine district, San Bernardino county, John O'Donnell has made a strike in his claim which has resulted in depopulating Barstow, the entire community joining in the rush. The region has been located for miles. O'Donnell claims most of Barstow under an old mining location. The Santa Fe Co. has built its roundhouse, depot and freight yards on lands within his claim, and has begun suit to quiet title. Saturday he uncovered rock which was very rich in gold. Samples were assayed by the Bagdad-Chase Mining Co., the assay showing a value of $352 a ton. The news quickly spread, precipitating a grand rush. This strike increases O'Donnell's chances for holding his claim against the Santa Fe.

The presence in this city of a number of the Guggenheim smelter men, who are conferring with the local managers, has renewed interest in the proposed large copper smelter on the shores of San Francisco bay. The trust has been busy for some time making contracts for copper ores and buying up promising properties.

The Guggenheims are also much interested in the establishment of a steamship line between San Francisco and Seward, Alaska, to connect with the Alaska Central Railway. The road is opening up a country rich in coal and copper; the latter is eagerly sought by the smelter men, and 4000 tons a month are now being shipped to Tacoma from Seward. Moreover, the trust has purchased the Dempsey copper properties near Smartsville, which have been thoroughly experted and proven to contain a rich and extensive deposit. They have been operated heretofore on a very limited scale. Ore from the Copper King, near Fresno, to the amount of 200 tons a day will go to the new smelter instead of to Tacoma, as at present. It will also handle large quanti-

ties of ore from Mexico and South America.

The California Petroleum Refineries have purchased 150 acres of land at Port Harford—which is the port of San Luis Obispo—and will within three months commence the construction of an oil refinery at a cost of nearly a million dollars, including the laying of a pipe-line from the Santa Barbara oilfields to the refinery, and construction of a wharf for the shipment of oil.

The rifled pipe line recently constructed between Bakersfield and Delano, a distance of thirty miles, by the Southern Pacific, has been subjected to a pressure of 1000 lb., and the water with which the pipe was filled failed to find an exit anywhere within the entire distance. Within a few days oil is to take the place of water and the work of pumping to Delano will begin, thus showing that the heavy oil of Kern river can be carried more readily through a rifled than a smooth pipe. It is said on good authority that if the experiment to Delano is successful, the pipe line will be continued north to Fresno, and eventually to the bay.

In the action brought by the county of Sutter against George S. Sargent, which was decided by the Superior Court of Sutter county in favor of the association and affirmed by the District Court of Appeal, the Supreme Court of the State has granted a rehearing. Sargent has a hydraulic mine, for which he received a permit to mine from the California Debris Commission, but the Anti-Debris Association served injunction upon him through the county of Sutter. This is rather a noted case and the final outcome is looked forward to with interest by hydraulic miners.

In the Los Angeles Stock Exchange there are 14 mining companies officially listed, but they are all stocks of properties in Nevada, Mexico and Arizona, no California companies being collected. Not a single share of Goldfield, Tonopah, Bullfrog or Comstock mines has ever been listed or sold on the floor of the exchange. In fact, there is practically no trading in that city in stocks where the mine has passed the prospecting stage, so that mining shares are not looked on with great favor by the brokers who are handling industrial stocks only. Still there are men in Los Angeles anxious to see the establishment in that city of a mining exchange such as exists in San Francisco, but thus far those of this character which have been started have been failures through lack of business to maintain them.

The new smelters of the Mountain Copper Co., of Shasta county, recently started at Bull's Head point, near Martinez, on the San Francisco bay shore, have shipped their first output of copper consisting of 150 tons of matte. It was sent to San Francisco, there to be loaded on a vessel to be taken around Cape Horn to the refineries in New Jersey. The refinery at Bull's Head is not yet completed.

In Congress Representative Gillett, of this State, has introduced a bill amending the act creating the California Debris Commission so that the body can issue an order directing the manner of hydraulic mining, protecting public interests by authorizing impounding works on navigable waterways, expenses incident thereto to be borne by the mine owners. In cases where operations can be carried on without injury to navigation, the commission may permit mining without retaining works for the tailings. In explanation of this it may be said that there are numerous small hydraulic properties in the mountains where no dams are necessary to restrain debris, but under the present laws no permits may be granted to the owners unless dams are built. As a result the mines lie idle, while they could be worked as well as not without injury to any interests.

Salt Lake City. Feb. 2.

A series of snowslides in Little Cottonwood cañon has put the five-mile tramway of the Continental Alta Mines and Smelters Co. out of commission, and the opinion prevails that it will not be rebuilt. The tramway cost, it is said, about $60,000. Little Cottonwood cañon is treacherous in winter, and it is seldom that this season of the year passes without slides. It would be difficult, indeed, to build a tram system that would escape them entirely. One slide swept through the town of Alta a few days ago, killing four and taking out part of the Columbus Consolidated Mining Co.'s. power line.

The Butler Liberal directors have levied an assessment of 2c. a share, calling for $10,000. This Bingham company has an indebtedness of $6000, but is keeping up development work. A control of the property recently passed to W. C. Orem, of Salt Lake and eastern associates.

The old camp of Pioche, in southeastern Nevada, has taken on quite a lively boom, and property values in the town are said to have more than doubled during the past 90 days. There is not much doubt that the district will have rail transportation during the present year, perhaps within a few months, as a branch of the San Pedro, Los Angeles & Salt Lake will be built from Caliente, a distance of about 40 miles. The Utah-Nevada Mines and Smelters Co. is getting ready for a big campaign. It has re-timbered the shaft and underground workings of the Day mine at Jack Rabbit, 16 miles from Pioche. An aerial tramway, a half mile long, has been built connecting the mine with a loading station on a narrow-gage line of railroad over which ore was transported to the smelters at Pioche during the former prosperous days. This line has been repaired, the old equipment overhauled and placed in operation again. In the town of Pioche the Utah-Nevada Co. has the triple-compartment (No. 5) shaft practically re-timbered to a depth of 1200 ft. Ore from the porphyry ledge will be taken out through this avenue. The ledge is from 4 to 30 ft. in width and it carries much lead-silver values. The company contemplates many other improvements, which will probably include the rebuilding of the old smelter at Pioche and its equipment with modern facilities. This will be done unless a favorable contract can be obtained from the Salt Lake smelters, which is not all unlikely, as the American Smelting and Refining Co. is about to send its field representative to the camp to institute a thorough investigation. The company has established an office in Salt Lake City. A. F. Schneider, a New York mining engineer, has been named as general manager of the Utah-Nevada properties, which includes the Last Chance mine in Bingham.

The annual meeting of the Yankee Consolidated Mining Co., which operates in the Tintic district, resulted in the election of John E. DuBois, president; J. E. Frick, vice president; L. A. Amsden, secretary and treasurer. The financial statement showed that the year ended Dec. 31 with a cash balance of $68,323 on hand. One dividend of $25,000 was paid during the year and $20,200 was expended in prospecting and new development work. Ore was sold to the value of $89,789. The physical condition of the mine is better than it has been for some time. Plans for the building of a mill were discussed.

About 1,500 men are employed in the construction of the new Garfield smelting plant of the American Smelters, Securities Co. It will be ready for operation, at least a portion of it, some time next May.

The work of clearing the caves in the Ontario tunnel at Park City, which stopped the flow of the water through that adit about a year ago and endangered the existence of some of the principal mines of the Park City district, has ceased indefinitely. It is believed that the deal which has been pending for some time for a possible merger of the Daly West, Daly and Ontario mines, will soon be consummated. In this event, the task will be undertaken again.

Except for the ratification of the same by shareholders of each company, a deal has been consummated for a consolidation of the Silver Shield and United Bingham mines in Bingham. The new company is to be known as the United Bingham Consolidated, with 500,000 shares of the par value of $5 each. Shareholders of the present Silver Shield company are to receive 165,000 shares in the new company and those of the United Bingham, 100,000 shares, the balance going into the treasury as working capital.

Denver. Feb. 2.

After nearly two weeks of uninterrupted blockade on the Denver & Rio Grande railroad, between Durango and Silverton, trains are running again. Mining and operations connected with the construction of several mills had been badly interfered with; a large portion of the line was covered by snowslides, the snow being piled to a depth of 60 ft. in a number of places. Nearly 300 carloads were delayed at Durango and will be rushed through as fast as possible.

The territorial Supreme Court of New Mexico has reversed the decision of the lower court in the case of the Colorado & Arizona railway against the Denver & Rio Grande, and the former company, which is a Southern Pacific corporation, is at present on top in this litigation, which involves a number of crossings of the projected Southern Pacific line and the Rio Grande line from Durango to Farmington, which has just been completed, the latter railroad having furnished a large bond when this litigation commenced.

Last week I reported the sale of a large amount of coal-land near Durango to the Southern Pacific Railroad Co. Since then representatives of the Denver & Rio Grande system have purchased the holdings of the Boston Coal and Fuel Co., the transaction being closed in this city and involving the transfer of about 1000 acres of coal-land at the figure of about $75 per acre.

In consequence of an oversupply of low-grade sulphide ores from the mines in Clear Creek and Gilpin counties the American Smelting and Refining Co. increased the treatment charges $3 per ton, which may affect the shipments from the Idaho Springs district somewhat, although it will throw a larger amount of business into the concentrating plants.

Another railroad for the Arkansas Valley is contemplated, according to the filing of incorporation papers at the capitol within the past few days of the Arkansas Valley Railway Co., with a capital of $1,000,000. It is the present intention to build from Pueblo to the Kansas boundary line by way of Rocky Ford, Las Animas and Lamar, competing for traffic with the Santa Fe system.

Leadville. Feb. 3.

The drift from the Penrose to the Coronado shaft has passed the half-way mark and during the week encountered an extra flow of water amounting to 100 gal. per minute, which is being taken care of by the pumps at the Penrose. From the 600-ft. level of the Penrose a drift is being run to the Grey Eagle, south, to open the large body of manganese ore that is in that property. The Western Mining Co. has a contract to supply the Illinois Steel Works with 50,000 tons of this class of ore. The drift will reach the body of ore by the latter part of February, when shipments will commence.

Considerable ore is at present being shipped from the old Adelaide Park section. From the Humboldt 50 tons daily are being shipped, the ore being a silicious lead; about the same amount of iron is going out from the Park shaft. while from the Flagstaff occasional shipments of good ore are being made. In the latter property the main ore-shoot has not been cut as yet.

The different properties on Rock hill are in excellent condition; the shipments are steady and of a good tonnage. As development work proceeds at the Murphy shaft, on the lower levels, the ore becomes richer and is found in place; the property is at present shipping 30 tons daily. The Dome shaft has reached a distance where drifting to the old workings is now practicable, and when the connections are made the output from the mine will be doubled. No ore is being broken at present at the Bessie Wilgus, as air connections are being made with the Reindeer. At the Nil Desperandum in the south drift upraising has been started, and the prospects are bright for catching the main orebody; the character of the ground at present cut is similar to that found in the drift, contact heavily stained with mineral. Casey & Nelson, leasing on a portion of the Crown Point, are shipping a fair tonnage of good ore.

The body of ore caught while upraising in the Ella Beeler, Iowa gulch, is improving both in quantity and quality as work proceeds on it. The first shipment will be sent out this week and it is expected that the ore will hold up to $20 per ton. A shipment was made during the week from the Ready Cash which will net the owners high in gold. So far the streak is small.

The Little Nell, Carbonate hill, is shipping some of the richest silver ore in the camp. A body of the old-fashioned sand carbonates was opened a few days ago and mixed with the carbonates are several streaks of chlorides, which enhance the value of the main orebody; the shoot so far opened is 3 ft. wide.

The lessees on the Fortune are shipping 50 tons daily of oxide and silicious ores, and it is probable that they will get down to the lower levels in February to open the sulphide bodies in virgin territory. The Brattleboro in the same section, Big Evans gulch, is drifting east and northeast to locate the orebodies known to exist in that territory. A regular tonnage of 25 tons daily is being sent out from the Little Ellen, Favorite and Izard. The Kohinoor and Elmore, to the south of the Izard, will probably resume operations in the near future. From the upper workings, some years ago, good iron was shipped; when the claim starts up again the shaft will be sunk deeper to catch the extension of the Resurrection ore shoot.

The Cloud City, down-town section, is busily engaged in opening up the bodies of manganese ore recently struck, and in another two weeks will be in a position to ship 75 tons daily of this class of ore. The ore is high-grade, running from 35 to 47% manganese.

Cripple Creek. Feb. 3.

A meeting of the stockholders of the Golden Cycle Mining Co. was held this week in St. Louis and the following directors elected for the ensuing year: J. T. Milliken, L. K. Carter and Louis Helm, of St. Louis; F. G. Logan, of Chicago, and H. McGarry, of Colorado Springs.

It was decided to spend $400,000 in fitting up the Telluride mill at Colorado City to treat the ore from this property. It is understood that the mill will be ready for operation about August. Cyanide will be the process used. The mill was recently purchased by the company. A large amount of work will be done on the mine. A good many surface improvements have been installed lately.

The report of the officers of the Vindicator Co. show this property to be in a very good shape indeed. Among other things it shows that during the past year the total net tons shipped from the mine were 24,070, of which the gross value was $678,574. A total of $143,000 was paid in dividends during 1906. The total cash resources on Jan. 1 are given as $173,205. The reports also show the physical condition of the property to be very good and there is a large amount of ore in sight. The addition of the Hull City placer to the property of the company increases its value. Pumping will soon be commenced and the levels below the 1,000 will soon be in shape again. No pumping has been done since the miners' strike of 1903.

Conditions at the Findley mine continue to be very good indeed and not only is there a heavy production but a large amount of ore in sight, especially on the lower levels.

The work of sinking has commenced on the South Burns shaft of the Acacia Co. The compressor is in place at the Forest Queen and considerable work will be done from now on. It is understood that the cyanide mill in Pony gulch that has recently been destroyed by fire will at once be rebuilt.

Duluth. Feb. 2.

The new ore-thawing device at the Zenith Furnace Co.'s plant, at Duluth, has now been in operation for some weeks and is a success. Ore that comes to the furnace yards from Mesabi range mines, after having been on the line for 12 to 20 hours, is frozen quite hard, even in the present mild weather, but it is thawed and ready for the charge in about four to six hours. The device consists of hot air blown by fans, and is quite different from the customary plan of thawing ore. It was installed by the Buffalo Forge Co.

The furnace company is making more iron than ever before in its history—about 6,000 tons in January.

All sorts of stories as to changes in the management of the Oliver Iron Mining Co. and the Amalgamated Copper Co. are flying about here, but no definite information has been given out. There will be a number of changes in the Oliver Co. consequent on the withdrawal of L. W. Powell, assistant general manager, to become head of the Bisbee mines controlled by Duluth and Calumet parties and Pittsburg men associated with the Carnegie Company.

A considerable amount of Menominee ore is moving to Cadillac, Mich., where the furnace of the Mitchell-Diggins Iron Co. is going into blast about March 1. Already shipments of Hemlock, Pewabic and some other ores are being made there. The furnace will require about 250 tons of ore daily, and its ores will be from the Menominee range.

The Florence-Iron River Mining Co. is to install a 10-ft. double-drum hoist at No. 7 shaft, to replace the machinery now in use, and will add a large gyratory crusher. The plant will double the capacity of the shaft. Improvements will be made in the surface tramming system and preparations are in progress to increase the mine's product for the coming season, due to the large additional ore reserves recently opened.

Offices of the Pickands, Mather & Co. mines on the Menominee range have been moved from Amasa to Iron River, and the company's operations will be materially increased.

The new ore dock of the Chicago, Milwaukee & St. Paul road, at Escanaba, is moving along slowly on account of delay in the receipt of material. About 175 men are now busy on construction. The dock will be 1,475 ft. long and 73 ft. high, making it one of the highest on the lakes, and of great capacity. It is to cost about $800,000 and will be done late this year. In all there are about 28,000,000 ft. of western timber coming to various ports along Lake Superior and to Escanaba for dock construction this winter, and one dock alone, that of the Duluth, Missabe & Northern, will consume more than 10,000,000 feet.

Corrigan, McKinney & Co. and the Bristol Mining Co. are to build 35 dwellings for miners and engineers and have already let contracts. The Cleveland Cliffs Iron Co. has built during the past few months about 50 dwellings, and the Oliver Iron Mining Co. is now building at Bovey 15 or 20, as well as more at other points. The Clark and Chisholm mining companies, at Hibbing, are moving off their locations all the dwellings there, in preparation for caving the ground on which they were.

Longyear & Hodge, who have long been drilling on the Mesabi and more recently on other iron-ore districts around the lake, have now sent two drills to the end of Keweenaw point, where they will work three machines for the Keweenaw Copper Co. One drill has been there some weeks.

G. A. St. Clair is to sink a shaft on the Meadow deposit, on section 3—58—15, containing about 400,000 tons of merchantable non-bessemer. His lease is at the rate of 40 c. a ton and 40,000 tons a year minimum output. D. T. Adams and associates are fee-owners.

The Jones & Laughlin Co. will ship about 850,000 tons the coming season from its Mesabi range mines, Leetonia, Lincoln and Grant. The Lincoln has two shafts and is well equipped; the Leetonia is open pit and contains a large deposit. and the Grant is being equipped with a new clam-shell stripping and mining device designed by Hoover & Mason and expected to be ready for mining in early spring. It has been under construction for nearly a year and is unique. The company's shipments from Ishpeming will be lessened somewhat this year.

Platteville, Wis Feb. 2.

It is reported that at the West Empire, a property that was one time condemned after it was thought to be thoroughly prospected, in sinking the main shaft, a 6-in. sheet of nearly pure jack has been exposed.

The company drilling just north of the Great Northern reports its first ore in the 30th hole, an example of perseverance. In running a crosscut at the Great Northern, a 4-in. sheet of zinc and lead was struck having a 45° pitch, which old miners claim as one of the surest indications of an extended flat.

Another strike of importance is reported by the Rockford Co., which is drilling just on the edge of town, in the Platteville camp. The Rockford property adjoins the Oudyn, where a complete hoisting and pumping outfit is being installed.

The mill of the Morrison Mining and Development Co. will start up during the week, after several months shut-down, during which time some extensive development work was done.

The Hibernia is the first of the recent strikes that report the ground sufficiently developed to yield enough dirt to keep a 100-ton mill in operation. Plans and specifications are being drawn by the Galena Iron Works Co. for a complete power plant and concentrator. It is the intention to build a magnetic separator later. The Hibernia was developed originally by local men, among them Hon. J. W. Murphy, Frank Pitts, etc. The company is in good financial condition. It is the intention to sell enough treasury stock to pay for the roaster, it being the policy of the management not to contract for anything unless the money is in the treasury.

The recent experiment in connection with the Galena type roaster, and Cleveland-Knowles separators has proved quite satisfactory and has demonstrated that the highest possible efficiency so far in the district is obtained from the separator as last installed, several changes in the internal arrangement of the cylindical kiln having been made. From the Kennedy ore, assaying originally 34.9 zinc and 16 iron, the average assays show finished roasted product of 61% Zn with less than 3% Zn in tailings and 3% Fe in the finished heads. This is quite remarkable, when it is taken into consideration that the zinc crystals upon assay show that there is chemically combined from 2.9 to 3% iron.

Indianapolis. Feb. 3.

The coal miners' and operators' joint conference has adjourned without accomplishing the much-desired result, and the business and industries of this country are threatened with an enforced cessation because of probable strike of the 600,000 miners on April 1. In order to present the points on which the miners and operators failed to agree, and which has occasioned the threatened strike, it is necessary to review the organization of the Interstate Joint Conference. This is composed of the bituminous operators and miners of western Pennsylvania, Ohio, Indiana and Illinois exclusively. It is the only organization of the kind and the contracts, or wage agreements, it has made since 1897 have been the basis for any other agreements that may have been made between miners and operators outside these limits.

It has been the policy and ideal of the United Mine Workers to make a wage contract covering all fields, both anthracite and bituminous, at one meeting, and they have sought to make the Interstate Conference the nucleus of such an arrangement by attempting for several years past to effect the admission of additional States. The Southwestern Joint Conference, which includes Missouri, Kansas, Arkansas and Texas, was formed within the past two years.

The wage scale presented by the miners on the first day of the Interstate Joint Conference, which adjourned Feb. 2, contained the following general demands:

1. The admission of the Southwestern States to the Interstate Conference.

2. A general increase in wages for all persons employed in and about the mines of 12½ per cent. per ton, or day's pay, if day laborer.

3. A run-of-mine basis, that is, the miner to be paid for all coal mined and loaded on the mine cars without screening.

4. A flat differential of 7c. a ton between pick and machine mining; that is, whatever the piece price may be, the machine price shall be 7c. less.

5. Exclusion of boys under 16 years of age from the mines.

On the other hand, the first proposition made by the operators on the first day of

the conference, Jan. 25, was: "We demand a reduction in wages; we have not determined the amount. We are willing to submit our books for inspection and will agree to increase or decrease wages in the same ratio as the selling price of coal is shown to have increased or decreased since the making of the existing agreement in 1904."

Both propositions were rejected by the joint conference. The demands of each party were then submitted to the joint scale committee. After four days' consideration an executive meeting of all operators of the interstate field was called. At the conclusion of this meeting the scale committee was called together again and the operators submitted the following:

"We will sign the present scale for one year from April 1, 1906; with the run-of-mine basis in Illinois, where the basing point shall be Danville, and the price for pick mining 52c. a ton, to include necessary timbering, shot-firing and deadwork."

This proposition is the present scale, except that it places the cost of the shot-firing, etc., in Illinois on the miner instead of on the operator, where it now rests by statute, which also provides for the run-of-mine basis.

This proposition was rejected by the miners' members of the joint scale committee, and upon reference to the joint conference, it was again rejected by the miners of that body, and the joint conference adjourned. The miners' convention was then called to order and the action of its members in joint conference ratified.

It is now claimed that only the intervention of a powerful and influential third party between the miners and operators of the United States can avert the crisis. The scenes at the closing hours of the remarkable convention showed that neither will make overtures to the other for further negotiations. On April 1, unless the increase in wages they ask is granted, 550,000 miners will walk out of the coal mines. As a parting suggestion the operators agreed to an arbitration, but the miners said they could not agree to arbitration in which the operators reserved the right to name the members of the arbitrating committee.

The National Executive Board of the United Mine Workers was called in session immediately after adjournment and began the preparations for the threatened strike. In addition to a large fund now on hand, the miners will be assessed $1 a week until April 1. The strike means the expenditure of millions of dollars and the most careful arrangements are being made to provide for idle men and their families.

There is an agency which may operate to bring the warring factions into subjection. This is the National Civic Association, of which all the national officers of the United Mine Workers and many of the operators are members. It is one of the functions of the Civic Association to act as intermediary in labor disputes.

The possibility of a strike has had a quickening effect upon local industries, interurban, street and steam railroads, all of which have doubled their orders for coal during the next two months. There has not, as yet, been any advance in prices, but this is anticipated any day.

Grounds for the refusal by the operators of the miners' demands for an increase in wages were that conditions of trade did not justify an increase. Advances in wages to labor in the mining industry since 1898 have reached 100 per cent., while there has been but one reduction of 5½ per cent. in that time. The operators say the demand for a 12½ per cent. increase on the ground of the great prosperity of the country is not tenable. It is up to the miners to determine whether they will work after April 1 or go on a strike.

Scranton. Feb. 5.

There are many foolish and conflicting reports in the anthracite region in connection with the action of the operators in view of the termination of the agreement in April next. Despatches are being sent out from different points in the region, giving credence to some ridiculous stories. The most recent was one from Mahanoy City, which stated that all the mines would be idle during the month of March as a countermove to any strike talk on the part of the miners, and that this long idleness would be possible owing to the immense stock of coal. A day or so later another despatch was sent from the same place, stating that all the collieries in the anthracite region had received orders to work full time until next April, and that a number of washeries which had been idle, would also resume operations. The companies, it was explained, expected to have 3,000,000 tons of coal within the next eight weeks.

The correspondent of THE ENGINEERING AND MINING JOURNAL waited upon a number of the heads of the coal departments, who ridiculed the stories emanating from the lower valley. "It would be absurd," remarked one, "to believe that such an important move would spring from a place like Mahanoy City. There is absolutely no foundation for any of the despatches. There is no preparation for any strike whatever, and I am confident that the large companies will not stock at all. In the first place, instead of working full time, it is more probable that there will be dull times. The open weather has proved so disastrous that there is no demand for any coal except pea and buckwheat. It is true, however, that there is more or less coal stocked, but not by the companies. There are quite a number of brokers and dealers who were apprehensive that there would be a strike, and they ordered an abnormal amount of coal, which has been delivered. This is stocked over a very wide territory for the benefit of those people who suffered from a lack of coal during the last strike of the anthracite miners. They are the people who determined to take no risks again. These stocks are not held by the companies. During the past week the suspensions have been general throughout the region, and you will find that it will continue until we get more wintry weather."

The breaker of the Pine Hill Coal Co., which is a remarkable structure, is nearing completion. The entire lower part, including the foundation walls, coal and slate pockets are of reinforced concrete. It is the only concrete breaker built here, and its completion is watched with great interest. The breaker consists of ten bents, spaced from 12 to 14 ft. apart, and varying in length from 90 to 118 ft., and in hight from 29 to 511 ft. These bents are 24 in. in thickness and consist of a series of reinforced arches and reinforced columns. The columns rest on reinforced footings and wall, and the footings are so arranged that if any settlement occurs it will not be localized, but distributed over the whole breaker. The columns are securely tied to one another in the plane of the bents, so that any excessive loads or vibrations would be well distributed over the whole bent.

A fire which has been raging for 49 years has just been controlled. In 1857 some deer hunters near the old Greenwood mine, of the Lehigh Coal and Navigation Co., near Tamaqua, carelessly allowed embers from their camp fire to fall into the air hole leading to the mine and a body of gas was ignited. Since that time many attempts have been made to extinguish the flames, and a number of lives have been lost, but all the work of reclaiming was in vain until two years ago, when the engineers adopted a plan of forcing a mixture of water and culm into boreholes leading into the mine. The culm eventually smothered the greater part of the fire, and it has now become possible to flood the entire working.

The Pennsylvania Coal Co. is expending considerable money on the opening of the new slope near Plainsville, which is to furnish coal for No. 14 breaker. There is no roof-rock over the first vein of coal at the point where the slope was sunk, and it has been necessary to build extensive stone work at the opening. This has been completed, and the slope has reached the coal, which is of excellent quality and quite thick. A brick engine-house is being erected. An air shaft is also to be sunk.

A report has been spread that the Markle interests were to be acquired by the Lehigh Valley Co. Superintendent Smith is authority for the statement that the Markle collieries are not for sale. Nevertheless there are some coal men in the region who are predicting that the Lehigh

will gain possession of this valuable property.

A novel suggestion has been made by the Lehigh Valley Co. in the Hazleton district in connection with the assessment of coal lands. Last year the valuation upon these lands was increased from $200 to $500 per acre. The company claims that this is excessive, and has invited the members of the Board of Appeals to take a trip into the mines in order that it be demonstrated that the coal lands are not so valuable as supposed by the assessors. The board has accepted the invitation, and it will be the first instance where any board in the anthracite region will assess coal lands after seeing the same.

It is understood that at a meeting of the operators and miners in New York on Feb. 15, the spokesmen in behalf of the operators will be President Baer, of the Philadelphia & Reading, and President David Willcox, of the Delaware & Hudson. It is understood that the operators will stand pat for a continuance of present conditions, which they claim should be more than satisfactory to the miners. The leaders of the mine workers will not discuss their view of the controversy.

A charter of incorporation is being sought for the Moss Glen Coal Co., of Hazleton.

The collieries of the Hillside Coal Co. and the Pennsylvania Coal Co.—the Erie collieries—were idle for five days last week.

Carbon county has two mine inspectors covering the same territory. Morgan O. Morgans, who qualified before the Lackawanna county board and was also duly elected by the people, was not recognized by Chief Roderick, for the reason that he should have qualified before the Luzerne board. Mr. Morgan on Jan. 1 went ahead, and regularly inspected the collieries in the county, while David J. Roderick was assigned by the chief inspector for the same district. The question will be taken into the court when Mr. Morgan will sue the State for his salary.

H. L. Cole, of Scranton, last week began a trip about 50 miles long through the mine workings from Avondale to Carbondale. The question has frequently been discussed as to whether it was possible to traverse the anthracite region underground the entire distance, and Cole stands ready to prove that it is. All the workings, it is said, connect, the gangways having been driven in former times in so loose a manner that one company frequently trespassed on the property of the other. In many instances the workings of different collieries have been joined in order to provide an additional exit in case of accident.

Victoria, B. C. Feb. 1.

It is announced in the provincial press that owing to the great increase in the demand for coal lands situated in the two new western Canadian provinces (Alberta and Saskatchewan) and in parts of British Columbia known as the railway belt, the Dominion Department of the Interior has decided to revise the method heretofore in force in dealing with applications for such lands. Hereafter if the first instalment of the purchase price be not paid before the expiry of the period allowed when an application for coal lands is accepted by the department, such applicant's right wil be held to have absolutely lapsed. When payments have been made on account the rule will be, on and after April 1 next, that if further payments are not made on the dates fixed by the terms of sale, the rights of the purchasers will be forfeited. If a purchaser does not wish to complete the payment on the whole of the tract covered by his application, and he so notifies the department before April 1, next, he may be permitted to apply the amount which he has paid on the whole tract to a portion thereof, in such a way that this amount may complete the purchase of such lesser portion of the original tract.

East Kootenay.—The St. Eugene mine is again employing a full force of men, machinery and buildings destroyed by fire about three months ago having been replaced.

Rossland.—Last week's shipments from Rossland mines totalled 6,560 tons, making the aggregate for the year, 26,050 tons.

It is reported that a body of ore of good grade has been encountered on the eleventh level of the Centre Star mine.

Boundary.—Ore shipments from Boundary district mines last week totalled 24,801 tons, as follows: Granby Co., 14,837 tons; British Columbia Copper Co., 3,960 tons; Dominion Copper Co., 5,324 tons; Oro Denoro, 600 tons; two high-grade mines, 80 tons. Shipments for the year, total 78,996 tons. The three Boundary smelters made a new record by smelting during the week 26,173 tons of ore, in the following proportions: Granby Co., 17,422 tons; B. C. Copper Co., 3,665 tons; Dominion Copper Co., 5,086 tons; total, 26,173 tons. This brings the total quantity of ore smelted in the district since Dec. 31, 1905, up to 84,345 tons.

A 7-drill air compressor, supplied by the Allis-Chalmers-Bullock Co., of Montreal, has been received at the Dominion Copper Co.'s Rawhille mine near Phoenix. This engine, which will be operated by electricity, is being installed at the mine.

A large body of shipping ore has been encountered in a crosscut tunnel driven on the Dominion Copper Co.'s Idaho mine at Phoenix. At 70 ft. in from the portal the whole face of the tunnel was in ore. No shipments of ore from this mine, however, will be made until after the two railway companies hauling ore from Phoenix mines shall come to an arrangement to allow of ore loaded on the cars of one being transferred to the tracks of the other where necessary to make connection between mine and smelter.

Mexico. Jan. 23.

It is understood from reliable sources that the large merger or consolidation of various mining interests in Guanajuato, mentioned in a recent letter, is an assured thing, and that the deal will soon be consummated and will involve something like $7,000,000, Mexican currency. Though the names of the properties included in the deal are not not yet fully known, among the prime movers in the business are Gus Beyer, of St. Louis; F. B. Magaw and H. L. Stewart, of Chicago; F. B. Tomb, of Pittsburg; E. H. Callahan, Louisville; W. P. Haughton, Richmond, and E. F. Warren, John Phillips, A. E. Lewis, A. E. Klingbell and Dr. J. I. Jones, of Milwaukee, who are at present in the Republic. They go from Guanajuato to Oaxaca to look into some other mining venture. Undoubtedly this new aggregation will add more stamps and larger cyanide mills to the camp, where such success has been obtained in the last several years in the extraction of silver from the ores and fine concentrates with cyanide. This process is even superseding the old patio process, as shown by the fact that one of the largest owners of the old patio is changing over to cyanide and shipping his precipitates to the National Metal Company in Mexico City.

That the American Smelting and Refining Company, whose immense smelting plants at Aguascalientes, Monterey and El Paso, with its new plants building at Velardena and Chihuahua, and pooled with the Torreon and San Luis Potosi independent plants, seemed to give it a monopoly of the smelting business in the republic, is to have a strong competitor in the shape of the United States Mining Company, seems now to be assured. This company, which has in the States the large plant in Salt Lake City, with the Bingham properties and the Centennial-Eureka back of it, and the Mammoth mine and smelter in California, had the present superintendent of its Mammoth plant, Robert D. Rhodes, making examinations last fall of several plants in this country, with the idea of purchasing; but without results at that time. It is now stated that the favorable location and conditions have been encountered, though not made public, and that $500,000 gold will be invested in Mexico to start; to be added to as the business demands. The presence of A. F. Holden in Mexico at this time with George A. Schroeter, of Denver, is looked upon as significant, and whether their intended trip to Pachuca has any bearing on the new move of the United States Mining Company, or is at all indicative as to the location for the future plant, cannot be learned.

General Mining News.

ALASKA.

Hon. John. P. Brady, Governor of Alaska, informs us that the copper mining and smelting industry of Alaska is in a prosperous condition, and that it is likely to grow with rapidity. On Prince of Wales Island, two smelters, one at Copper Mountain and the other at Hadley, will soon be in full operation. One has already started. The copper mines at Ellamar and Latonche on Prince William Sound are already making large shipments of ore to the Tacoma smelter. Other mines in the vicinity of these will soon be shipping ore. A great factor in the progress of these mines is the cheapness with which the ores may be transported, the mines being situated close to deep-water harbors. The copper mines of the interior are to be benefited by the railroads now under construction across Alaska. The sections drained by the Chityna river, which is the eastern tributary of the Copper river, are receiving the most attention, and a strong output may be expected from this region as soon as railroad facilities are secured.

ARIZONA.

COCHISE COUNTY.

Tombstone Consolidated Mining Co.—Fire in Tranquility shaft of this company ruined the hoist and head-frame, and the company is now erecting a new plant. The shaft was idle at the time of the fire, but should be producing ore by March. All the men who would now be at the Tranquility have been sent to the Toughnut, and that shaft is producing a small tonnage of silver-gold ore daily. At the company's great main shaft the water rose nearly to the 700-ft. level during the time the works were closed, but it is now lowering below the 800. The pumps are throwing 3,000,000 gal. per day, and it is very evident from the way they are lowering the water that the streams coming in are lessening. The work of sinking will be resumed soon. Shipments of silver and gold ores are steadily made and the new mill at the mines is being stocked with ore.

CALIFORNIA.

AMADOR COUNTY.

Clark-Mayon.—F. M. & W. D. Clark, owners of this property at Oleta, have applied to the California Debris Commission to mine it by hydraulic process.

Zeile Mining Co.—Underground work has been resumed in this mine at Jackson and the 40-stamp mill is running to its full capacity.

BUTTE COUNTY.

Banner.—This old mine, idle some years, has been bonded to Col. Spaulding, Geo. F. Kutz, of San Francisco, and D. M. Blood, of Oakland, and has been pumped out. The Banner yielded nearly a million dollars from its quartz veins in years past. A few years ago an English company that was working the mine had some trouble, and it was flooded just after a rich body of ore at the 600-ft. level was uncovered. Mr. Lindley is the new superintendent.

CALAVERAS COUNTY.

Wallace.—Numbers of shafts continue to be sunk at this town to develop the gravel beds recently found. The gold-bearing gravel is not confined to the town itself but is now known to exist some distances east and west. The permanent water supply of the vicinity is small.

INYO COUNTY.

Sacramento Mining Co.—The new 5-ft. mill of this mine has been put into the regular service, driven by a 35-h.p. gasolene engine. Sixteen men are now working in the mine.

Keynote Mining Co.—This company, at Lone Pine, has started a tunnel lower than the old workings at the level where the new mill is to be built. The old mill is running steadily.

Pleasant Cañon Mining Co.—This mine (also known as the Montgomery) at Ballarat, is now thoroughly opened after a year's development work. Part of the machinery for the mill has been hauled in, and a 50-ton cyanide plant has just started on the old pile of tailings. The old Bryan mill has been removed after turning out about $100,000 in the last year.

MARIPOSA COUNTY.

Alice Gold Mining Co.—This company at Hunter's Valley has erected a new mill which will shortly be set at work.

Oaks & Reese.—This old-time, formerly known as the Potts, after being idle 25 years, is to be reopened, and will soon be unwatered.

J. J. Jones.—G. Stewart and L. Kane, of Mariposa, have leased this mine at Whitlock, and will also sink a shaft on the Hart claim at the same place.

NEVADA COUNTY.

Brunswick Consolidated Gold Mining Co.—At the annual meeting recently the old directors were re-elected, with R. Gilman Brown, of San Francisco, president and J. Stadtfeld, Jr., secretary.

Iron Clad.—After a year's idleness, operations have been resumed in this mine at Grass Valley. The mine has been, during the past few months, thoroughly equipped with new machinery in the way of pumps and hoists, and once unwatered will be in a position to sink to any depth. In addition to the new Cornish pumps a great Amador pump or cigar-shaped steel tank will be used in forking out the water. When the mine struck a big inflow a year ago the old pumps were found inadequate to the task and the shaft was allowed to fill up. Just at the time the flood began, a rich body of ore was struck and the company is anxious to develop it.

PLACER COUNTY.

Al Gol.—John T. Cairns, of San Francisco, is about to reopen this mine, eight miles from Lincoln, as he holds a bond upon it. Only a limited amount of development work has been done by the German company which worked it a few years ago. New machinery is to be installed by Mr. Cairns.

Oest.—The old copper lead at the Oest ranch, in Lone Star district, has been revived again. Messrs. S. Fink, George Dierson and Mr. Deefenbrock, of San Francisco, have a bond on the property, and are now shipping 20 tons of ore for a test.

SAN DIEGO COUNTY.

Cinnabar.—T. J. Dean, of Sunnyside, 15 miles from San Diego, has discovered a cinnabar deposit on his ranch and work to develop it has commenced.

Donohoe.—This mine at Dulzara, owned by Donohoe Bros., is being developed. The new shaft is now down 175 feet.

SIERRA COUNTY.

Morning Star.—This mine, at Badger Hill, was recently closed down, owing to the filing of liens by the miners. The prospects are now that the men will get their money and operations be resumed.

Sierra Buttes.—At this mine, Sierra City, 120 miners are now at work under superintendence of W. D. Pinkston.

Comet.—This old quartz mine at the head of Jim Crow Cañon has been bonded to T. K. Code, superintendent of the Empire mine at Gold Valley, and a crew of men will soon be set at work.

Twin Eagle.—This mine at Kanaka, near Gold Point, has been bonded by F. M. Manson to the Empire Mining Co., of Gold Valley. John Reid, the superintendent, is making preparations to employ a larger crew of men.

SISKIYOU COUNTY.

Highland Mining Co.—This company at China Gulch, J. H. Tetherow, superintendent, will shortly enlarge the force of miners. The two-stamp mill is crushing high-grade rock. Some very rich pockets have been found of late.

Ault.—The quartz mill manufactured by the Etna foundry, has been installed by William Ault on his claims on Six-mile creek. The ore being stoped in the mine is expected to mill $40 per ton.

SONOMA COUNTY.

Magnesite.—The new magnesite mine north of Guerneville, has made its first shipment of crude material to the Western Carbonic Acid Co. of San Francisco. Warren McGray is superintendent of the mine.

TUOLUMNE COUNTY.

Black Oak Mining Co.—This company, at Soulsbyville, has started up again with a full force, now that there is plenty of water for power purpose.

App.—This mine at Jamestown has resumed operations and the big shoot of rich ore lately found will now be utilized.

Atlas.—The shaft of this mine has been unwatered so that active operations will be commenced at once.

Mountain Lily.—At this mine the concentrators and compressor have been each supplied with Pelton water-wheels so that they may be operated independently. There is some good ore on the dumps.

TULARE COUNTY.

Josephine.—A new mill is being installed at this mine, White River, and it will be ready for work in about a month.

COLORADO.

The Boston & Colorado Smelting Co. has announced that, commencing Feb. 1, it will pay an increase of 25c. per unit on the copper contents in ores over former prices. On account of improvements being made at the smelting works in Denver, the company will not recieve any low-priced ores for 60 days but the Chamberlain-Dilingham Sampling works, operating in Gilpen and Clear Creek counties has made arrangements to purchase all of these ores which are shipped so that the shippers of low-grade ores will not suffer.

BOULDER COUNTY.

Monarch Mining and Milling Co.—A big strike is reported at the Wano mine at Jamestown. The company is now building a cyanide mill of 100 tons capacity at Jamestown. T. S. Waltermeyer is president of company.

Avoca Group.—A half interest has been purchased for $5,000 by Fred W. Ehrlick of Ironton, O., on the group and the property is to be developed by tunnel workings. Property is located in Sunshine cañon.

Lincoln Mining & Milling Co.—This company, operating in the Sugar Loaf district, with Mr. Nelson as manager, is figurng on installing an air compressor and drills at an early date.

Boston Mill.—This mill at Ward has been purchased by Denver people; it is equipped with 50 stamps and is to be changed to a cyanide mill, for handling ores from the Miser's Dream, as well as custom ores.

Wall Street Mill.—It is reported that the big mill of the Wall Street Gold Extraction Co., has been purchased by W. F. Landers of Boston, and that it will be remodeled into a cyanide mill.

CLEAR CREEK COUNTY.

Richmond.—A lease and bond in the sum of $10,000 has been given on this property near Georgetown to Charles Estell & Co., and developments will be carried on through a tunnel. The lessees contemplate the erection of a mill whenever the property justifies such an outlay.

Crown Point.—It is reported that this group has been sold for $25,000 to the Bellevue-Hudson Mining Co. property is located in the Empire district. Machinery is now being overhauled for active operations.

GILPIN COUNTY.

Engelburg—Denver people have taken a lease and bond this property on Winnebago hill and are going to install machinery, erect a new shaft-building, and sink the shaft deeper.

Jefferson.—The east 435 ft. of the west 794.65 ft. of this claim has been sold to the Jefferson Calhoun Mining Co., for a consideration of $8,000. Property is located in Russell district.

Cataract.—Sternberger Bros. have opened up a good body of ore, it is reported, at a depth of 80 ft. The claim is in Russell district. They will sink considerably deeper and drift toward the main shaft of the Lotus group. The smelting streak is 15 in. wide, there being also a large amount of concentrating ores. Fred Wood, Russell Gulch, Colo., is in charge of operations.

Fifty Gold Mines Corporation.—This is a new organization, formed to take over the holdings of the Gregory-Bobtail Mining Co., owning and operating the Gregary-Bobtail and other properties between Central City and Black Hawk. Manager O. B. Thompson has gone East to perfect plans for operations on this group.

IDAHO.

SHOSHONE COUNTY.

The Northern Pacific railway is extending its lines from Burke about 800 ft. up Cañon creek, to provide an outlet for the Hercules ore. Huge ore bins will be erected there.

WASHINGTON COUNTY.

Seven Devils District—In this country much activity is reported and men are at work in many of the copper properties. The snow is 6 ft. deep on a level, but there are 40 sled teams hauling ore from Landore to Council, which is being shipped from there by rail to the smelter at Sumpter, under the contract made some weeks ago by Manager Fred D. Fuller, of the smelter. The sledding is good and the ore is being shipped out at a rapid rate.

NEVADA.

ESMERALDA COUNTY.

It is reported that Charles M. Schwab, and associates, who are interested in many Tonopah and Goldfield mining properties and who hold large interests in the Rand and the Crystal-Bullfrog gold mines, in the Bullfrog district, Nevada, have purchased two adjoining properties, the Montgomery-Shoshone and the Polaris.

The Montgomery-Shoshone has a shaft down 200 ft., with an extension of 200 ft. more through the orebody under way. The Polaris management has made plans to go down 300 ft., in connection with the Montgomery-Shoshone, and it is expected that the sale will not interfere with this standing arrangement. The control of all the Schwab Bullfrog properties is to be vested in a two-million-dollar holding company, which will be called the Montgomery-Shoshone Consolidated Mining Co., of which Mr. Schwab will be president and Donald B. Gillies, it is said, vice-president. Mr. Gillies is Schwab's mining engineer.

NEW JERSEY.

SUSSEX COUNTY.

New Jersey Mineral Co.—This company, recently organized with office at East Orange, N. J., has bought the Munson property of 320 acres, situated in Hardyston township, adjoining the property of the New Jersey Zinc Co. at Franklin Furnace. The property has not been prospected for ores, so far as known.

OREGON.

BAKER COUNTY.

Sumpter District—While the snow is very deep in the Sumpter camp and vicinity, yet more men are at work in that district than at this season in any previous years. Tom Besler has made a strike in the Nugget group in the Ibex camp. The Magnolia mine is running in good shape and the mill is working on ore from adjacent claims in the same group. Workmen in the Morning mine in the Greenhorn camp have cut the ledge in the lower level opening a large body of low-grade milling ore.

Burkemont—In this mine a ledge of copper ore has been cut at a depth of 170 ft. below the surface.

Virtue District—George W. and Edward Boreman now have some 15 men working on the big ditch which feeds the placer mine just below the old Virtue, 7 miles east of Baker City. They are putting the ditch in shape for the opening of the placer season.

Weatherby—What promises to be an active mining camp is Weatherby, about 30 miles southeast of Baker City, near the station of Weatherby. Quiet work has been going on in this camp for many months and a number of properties are being developed.

Cobalt Ore—Specimens of magnificent cobalt ore have been taken from a prospect near Baker City.

King — E. Griffith, who has been working the past few weeks at the King mine, property of the Commercial Mining Co., situated on the boundary line between Baker and Malheur counties, not far from Ontario, reports that the new 12-stamp mill on this property has been completed and the machinery in place, except the engine.

Gold Coin—An important decision was handed down this week by Judge Samuel White in the circuit court, involving a damage suit and injunction brought by A. P. Brown, a farmer living near Durkee, some 20 miles east of Baker City, against the Gold Coin Mining Co. Brown claimed that the mining company had violated its water rights, and also that the tailings from its mill were detrimental to his land, and asked that the defendant be enjoined. The court found for the defendant mining company on all points.

Highland—Another legal matter equally important was the case of J. E. Miller vs. the Highland Gold Mining Co., wherein the plaintiff sought to enjoin the officers of the defendant company from disposing of mining stock. Miller had filed a complaint against the company and its officers and had an injunction issued to prevent the sale of stock. The defendant answered the complaint and moved to disolve the injunction. The case was argued some weeks ago, and the decision given yesterday is in favor of the mining company, dissolving the injunction. The officers of the Highland Gold Mining Co. are: N. J. Sorensen, president; A. S. Diehl, vice-president; Frank Shelton, secretary and general manager.

SOUTH DAKOTA.

CUSTER COUNTY.

Saginaw.—An electric plant is being put in to furnish lights for the mine and mill. The use of electricity for power purposes is also contemplated. This will be the first mine in the Southern Hills to make practical use of electricity.

PENNINGTON COUNTY.

Ivanhoe.—Work on this property is progressing well. A cross-cut has been driven 100 ft. east and west and there is now sufficient water supply to run all the machinery with the exception of the stamps. At the present rate of increase of water there will soon be enough for that purpose also. The sinking pump has been moved to the bottom of the shaft.

Baltic Lode.—A 6-ft. ledge of ore, which prospects well, has just been encountered at this property. It is just over the line from the Deep Down property.

LAWRENCE COUNTY.

The annual output for 1905 exceeds $7,000,000. An increase is noticed at the Portland and Clinton properties, which more than offsets the shortage at the Horseshoe, where the mill was burned, and at other properties that have been unfortunate. The Horseshoe shows a tonnage of 50,440 with a valuation of $254,725. The Imperial milled 46,000 tons valued at $251,000. The Wasp No. 2, with 40,000 tons reached a valuation of $100,000. The Clinton milled 12,000 tons which brought $86,471. The Portland with a tonnage of only 1,600 brought its receipts up to $14,000. The placer output was about 5,000 tons.

Hidden Fortune.—The annual meeting of this company will be held on March 6. Its affairs are now in the hands of a receiver and several different sets of stockholders are each aiming at securing control.

Homestake Extension.—This company recently shipped a car of ore to the Woods Smelting Works at Denver and received satisfactory returns, $3.54 a ton having been saved on the plates alone. Taking into consideration the concentrates and tailings the value is not less than $4.50 a ton.

Mining Men's Association.—At a recent meeting this association put itself on record as opposed to the extension of a general homestead law in the Black Hills, but it also favored the passage of a law which should permit all bona fide settlers now residing on Black Hills land to gain title to such land by paying $2.50 an acre,. the same price which placer ground brings to the Government. The association is also endeavoring to have a distinction made between the taxes levied on productive and unproductive mining ground. At present the rate is the same.

Cleopatra.—At the annual meeting of this company a bond issue was authorized for the purpose of raising funds to develop the property on Squaw creek. A cyanide plant with a capacity of 75 tons has been erected on the property, but the mine is not yet sufficiently opened up.

TENNESSEE.

JOHNSTON COUNTY.

Taylor's Valley Iron Co.—This company has been incorporated to develop iron-ore property in Johnston county. R. C. Copenhaver, of Abingdon, Va., is president and manager, and S. V. Fulkerson, of Bristol, Va., secretary and treasurer.

TEXAS.

HARDIN COUNTY.

Saratoga.—Producers' Oil has discontinued drilling the wildcat or the east side of the field. The Griffey Petroleum Co. has started a new well near Rio Bravo. No. 222.

JEFFERSON COUNTY.

Beaumont.—The water shipments from Port Arthur for December were: Crude 282,567 bbls; solar oil 91,670; refined petroleum 60,000; gasoline, etc., 7,000; asphalt, 10,695 bbls. Crude prices have remained stationary for over 10 weeks in spite of dimishing productions and no immediate prospect of a new gusher field. The large storage is seemingly the only thing that retards a big advance in prices. The present daily output of all fields is approximately 68,000 bbls. and development is totally devoid of all sensation.

PRESIDIO COUNTY.

Western Cinnabar Mining Co.—This company has been organized to develop quicksilver deposits near Marfa. The capital stock is $150,000; the incorporators are Charles S. Murphy, T. C. Mitchell, F. E. Gillette, G. A. Mitchell and John Pumpris.

UTAH.

SUMMIT COUNTY.

Daly Judge.—This company's mill is now in good running order and is treating from 100 to 150 tons of ore daily. Much high grade shipping ore has been opened on the 1400 level. The mine will be a heavy shipper of crude ore during the present year.

TOOELE COUNTY.

Honerine.—This company is making good progress with the work of connecting the drain tunnel with the main workings. It is expected the work will be completed in March.

UTAH COUNTY.

Wyoming.—Eight thousand ore bags have been sent to this property. Shipments will be made at the rate of four cars per week.

VIRGINIA.

FAUQUIER COUNTY.

North Virginia Exploration Co.—This company is down 60 ft on No. 1 vertical shaft and will sink 40 ft. further before drifting. On No. 2 inclined shaft sinking is being pushed as rapidly as the scarcity of labor will permit. The lack of miners is seriously handicapping development work and arrangements are now being made by the management to bring in miners from another locality.

LEE COUNTY.

Monarch Coal and Coke Co.—This company has been incorporated with a capital stock of $50,000. C. D. Caldwell is president; R. L. Blevins, vice-president, and J. B. Baumgardner, secretary and treasurer. It is proposed to develop coal-mining property in Lee county and to establish a plant for the manufacture of coke on an extensive scale. Principal offices will be at Bristol, while the superintendent will have headquarters at Pennington Gap.

WASHINGTON.

Preliminary estimates on the production of coal in Washington for 1905 indicate a falling off in the output of the soft-coal mines throughout the central and western part of the State. One estimate is that the output was only 2,370,000 tons as against 3,137,681 tons for 1904. One reason for the lessened output may be the invasion of the Crow's Nest fields of British Columbia. The Great Northern is getting a large part of the coal for its western divisions from that district, and the sale of the fuel for domestic use is increasing throughout eastern Washington.

OKANOGAN COUNTY.

Ruby Mining Co.—This company, operating a property within a quarter mile of the Similkameen river, and about three miles south of the international boundary line, is developing a vein that has paid its way from the grass-roots. The company owns a group of claims embracing the Argentite, Pyrargyrite, Mystic Shrine, Beggar's Choice, Hide & Seek, Labyrinth, Crescent and Homer. There are several veins on the group, but only one of them is, at present, under active development. The Ruby vein strikes from northwest to southeast, bending more northerly along its course in the former direction. It dips southwesterly, 48°. It averages about 4 ft. in width, but expands to 15 ft. wide in some places. The pay-ore occurs in lenses from 7 to 10 ft. wide and carries antimony, iron, zinc, sulphur and arsenic, having its highest values in silver and copper, with $1 to $1.50 a ton gold. Lenses have been developed that average $2,000 a ton and over. but most of the ore, like in all other mines, is low grade. Up to this date the company has shipped 130 tons of ore and 26½ tons of concentrates which netted $82 a ton over the freight and treatment charges; with the wagon transportation to the railroad costing about $2,000.

The shipments were distributed as follows: one carload to Tacoma, Wash., one to Nelson, B. C., and two to the Everett, Wash. smelter, all of which was taken from the mine in developing, with no stoping of any consequence. The original claims of the group—the Hide & Seek, Labyrinth, Beggar's Choice and Mystic Shrine—were located by George Bowers and A. M. Reiste April 4, 1902, and were sold to the Ruby Co., which was organized Nov. 15 of same year. The company began work in January, 1903, and has operated the mine continuously ever since. After open-cutting, a drift was started at the apex of the cropping and driven 197 ft. southeastward on the vein. The next work was the driving of a cross-cutting tunnel 211 ft., which intersected the vein 58 ft. vertically lower than the first level. Drifts were driven respectively 500 ft. southeasterly and 389 ft. northwesterly, following the twist of the vein. Seven upraises, each 90 ft., connect the two levels. One upraise on the vein goes from the upper level, 42 ft. to the surface. From that level another upraise also ascends on the vein 62 ft. and a third 82 ft., but the latter does not reach the surface, because of the relative elevations of the outcrop. From a point 61 ft. southeast from the end of the northeast drift, an upraise ascends on the vein 148 ft. On March 17, 1904, a working tunnel was started at a vertical elevation of 62 ft. above the Similkameen valley and, according to the survey, would have to be driven in all 946 ft. into the hill before encountering the vein. It is now in past the 1,000-ft. point. The vein was encountered at 950 ft., and drifts are being driven each way. The tunnel will be driven ahead.

In starting this tunnel only three men were employed on breaking ground and timbering, until Sept. 3, 1905, the work was temporarily discontinued, but on Nov. 1, it was resumed with eight men. Six miners, a mucker, a blacksmith and a timberman now constitute the force, and the tunnel is being driven on three shifts, of eight hours each.

The formation each side the vein, in the No. 2 tunnel, is altered syenite. The various strata cut by the lower tunnel are slate, dolomite hornblende, porphyry and syenite, with here and there seams of calcite. The progress of the tunnel, with three shifts, has varied from 12 to 22 ft. a week, by hand drilling, but the company contemplates the use of machine drills as soon as power can be had for driving them.

The Ruby Co. has at present 500 tons of ore on the dumps, of an average value of $20 a ton, all of which was separated from the higher grade material already shipped to the smelters.

WEST VIRGINIA.

FAYETTE COUNTY.

McKell Coal and Coke Co.—This company has ordered from the Allis-Chalmers Co., of Milwaukee, an electrical power plant for its coal properties at Kilsyth. The new equipment will consist of a 26x42-in. heavy duty Allis-Chalmers engine and generator unit, 500 kw., 25 cycles, with switchboard, lightning arrestor, rotary converter and transformer equipment complete. The Allis-Chalmers Co. will superintend the erection of the plant at Kilsyth and the sub-stations, which are expected to be ready for operation in April.

M'DOWELL COUNTY.

J. J. B. Collieries Co.—This company has been incorporated with a capital stock of $200,000, for the purpose of manufacturing and dealing in coke, mining coal, etc.; incorporators of the company are H. M. Jewett, Walter Brooks and E. H. Jewett, of Detroit, Mich.; Jay W. Bigelow, of Marytown, and Wyndham Stokes, of Welch, W. Va. The property is near Marytown.

Foreign Mining News.

CANADA.

ALBERTA.

I. J. Grant and Dr. Riddell of Calgary, have bought machinery for the manufacture of brick in Calgary by the sand lime brick process.

Northwestern Gas-Oil Co.—After expending about $25,000 in boring for gas, this company has been successful in striking gas in the east end of Edmonton, at a depth of 1,450 ft. The gas was found in a stratum of sandstone underlying a streak of shale. The pressure of the present flow is over 250 lb. and increasing.

BRITISH COLUMBIA.

Boundary.—The Granby Consolidated Mining, Smelting and Power Co. is now running its works to their fullest capacity, having eight blast furnaces and two stands of converters in constant operation. The company is smelting about 80,000 tons of ore per month, and is making a little over 2,000,000 lb. of copper per month.

MEXICO.

United States Consul Hostetter, at Hermosillo, Mexico, reports, as a result of complaints made by certain foreigners that they are unable to secure adequate protection in working their mining claims, an order has been issued by the Secretary for Home Affairs at Mexico City, forbidding for the present denunciation of mining claims by all foreigners in the State of Sonora and in Lower California, and that patents for claims which had been taken up before the issuance of the order, but for which no patents had been issued, are being temporarily withheld.

GUANAJUATO.

Activity in the Guanajuato district continues unabated, and it will be but a couple of months more now before there will be 600 stamps dropping there. And experimental work still continues on the sands and old patio slimes in Guanajuato river under charges of Messrs. Bryant and McIlheney. Besides this, Al. Adams, formerly of New York, has formed the Negociacion Minera de la Paz, or Jesus Maria, and will put in 100 stamps and cyanide, as well as take over the Villariño mines of Castañeda and retimber them. The Mining and Development Co. of Guanajuato, under the presidency of W. M. Wiley, has taken up the Nueva Luz, El Torre, La Plata and El Sordo, and preparing to sink a 2,500-ft. shaft on the Nueva Luz.

It is said that the African Gold Fields Syndicate has, through George Schroeder and Bernard MacDonald, taken an option on the Perigrina at $2,500,000 gold. East of Guanajuato some 25 miles, at what is known as San Anton de las Minas, W. E. Butcher is trying to interest New York capital in the Ave de Gracia, on which W. E. Clark, of New York, has recently made a report.

GUERRERO.

In Guerrero, the Tres Aztecas Mining Co., which was organized some two years ago, with a capital of $150,000, and bought the Cerros Altos, Candelaria, and Mercurio, is having some trouble over the payments, and suit is threatened by the original owners; but it is thought now a compromise will be effected. On the Rio del Oro, Wm. Niven has transferred a large portion of his concession to an American syndicate, represented by Messrs. Brydon and Gibson, which will

put up the money for working the placers, and have Mr. Nevin in charge.

The Gardiner Mining Co. expects to soon resume operations at its mill under the management of A. H. Stockdale. At La Dicha properties of the Mitchell Copper Co., the smelter was blown in in July, and during the latter part of October and the month of November the production amounted to 29,000 lb. of copper per day. It is the intention to increase the plant from 350 to 550 tons capacity. Converters, ordered from the Union Iron Works, will soon be in place

Grading of the railroad from La Dicha to the harbor of Port Marquez is two-thirds completed, and it is reported that when the railroad is built a 2,000-ton smelter will be erected on the coast.

HIDALGO.

Real del Monte—This old mining property has been purchased by the Venture Corporation, of London, and the United States Smelting and Refining Co. These two companies jointly have acquired 90 per cent. of the stock of the Real del Monte, and have made arrangements to secure the remaining 10 per cent. The property is near Pachuca, about 60 miles northeast of the City of Mexico, and includes 6000 acres of land, on which there are a number of openings. Some of these mines have been worked since 1520. The property will be transferred to a new company, probably with $5,000,000 capital. It will be equipped with new machinery and worked on a large scale. The Real del Monte is one of the best known silver properties in Mexico. It has been owned chiefly by the Cuevas family for many years.

AFRICA.

RHODESIA.

The December gold output is given by the Chamber of Mines at 37,116 oz. bullion; the largest monthly return yet made. The total production in 1905 was 409,567 oz. bullion, against 267,737 oz. in 1904; an increase of 141,830 oz., or 53%. The bullion reported in 1905 was equal to 364,515 oz. fine gold, or $7,534,525 in value.

The silver production in 1905 was 89,278 oz., an increase of 19,133 oz., or 27.3%, over the previous year. The lead output was 570 tons, an increase of 116 tons.

The coal production in 1905, chiefly from the Wankie mines, was 91,964 tons, a gain of 32,186 tons over the previous year.

AUSTRALIA.

NEW SOUTH WALES.

Iron.—The New South Wales Government has completed arrangements with William Sandford, Ltd., of Lithgow, for the manufacture of iron and steel. The contract covers a period of seven years, and provides for the establishment within the State of blast-furnaces and other plant necessary for conversion of iron ore into pig iron and other products.

EUROPE.

BELGIUM.

The production of pig iron in Belgium for the full year was as follows, in metric tons:

	1904.	1905.	Changes
Foundry	105,830	102,263	D. 3,567
Forge	234,287	220,479	D. 22,808
Bessemer and basic	958,282	1,027,709	I. 69,427
Total	1,307,399	1,350,451	I. 43,052

The total increase in 1905 was 3.3%, the gain being entirely in steel-making pig iron.

SOUTH AMERICA.

BRITISH GUIANA.

The total production of gold in the colony in 1905 is reported at 95,253 oz. bullion; an increase of 4,544 oz., or 5%, over 1904. The bullion reported in 1905 was equal to 82,300 oz. fine gold, or $1,701,141.

The production of diamonds in 1905 was 5,283 carats, valued at $30,658, against 11,046 carats, valued at $85,947 in the preceding year.

Coal Trade Review.

NEW YORK, Feb. 7.

ANTHRACITE.

The hard-coal market is benefitting by a sudden cold snap, but the activity has not yet reached the producing companies; the local dealers see the difference and are talking of raising prices. Coal of all classes is in abundant supply, only the smaller steam sizes are consumed as fast as they arrive. During the warm weather producers were able to put quantities of coal in storage, and in the latter part of last week many mines were shut down, particularly those at which repairs were required.

Another reason for the stimulation of the hard-coal business is the ominous nature of the reports from the anthracite districts, and many persons think that a strike is almost assured. The drivers for the local dealers are already improving the opportunity to force recognition of their newly formed union and threaten to go on strike this week.

In spite of the abundant supply, prices are not affected, but remain as follows: $4.75 for broken and $5 for domestic sizes. Steam sizes: $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice and $1.30 @$1.35 for barley f. o. b. New York harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft-coal trade has shown stronger conditions within the past few weeks, owing to the strike talk in the press and to colder weather. An increased inquiry is noticeable, and those consumers with no large stock on hand are taking on additional quantities to be prepared. This seems to be the case in all consuming territories and the trade looks for a continuation of this condition as long as the strike remains a possibility, with the likelihood of advanced prices. The present quotations on ordinary grades of steam coal are $2.50@$2.60 f.o.b. New York harbor shipping points.

Trade in the far East is showing heavier demand and more orders than had been expected. The Sound is showing less disposition to harden than other territories, although there is a perceptibly increased inquiry. New York harbor is cleaning up its stocks at shipping ports and surpluses on hand are being consumed rapidly, though prices have not materially advanced. All-rail trade is calling for increased tonnages. Transportation between mines and tide is good and car supply is sufficient for those who do not leave stocks of coal at loading ports unprovided for by vessel tonnage.

Shipping in the coastwise market is in the usual supply and rates remain unchanged at the following quotations: To Boston, Salem, and Portland, 75@80c.; to Lynn and Newburyport, 90c.; to Portsmouth, 80@85.; to the Sound, 65@70 cents.

COAL TRAFFIC NOTES.

The total coal and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to Jan. 27, was as follow, in short tons:

	1904.	1905.	Changes.
Anthracite	295,026	396,950	I. 101,924
Bituminous	1,971,317	2,729,489	I. 758,172
Coke	756,166	972,273	I. 216,107
Total	3,022,509	4,098,712	I. 1,076,203

The increase is heavy, even over the large shipments of 1904.

Shipments of coal from the Broad Top region in Pennsylvania for the week ending Feb. 3 were 17,100 tons; for the year to Feb. 3 they were 98,396 tons.

Birmingham. Feb. 5.

The coal production in Alabama is heavier right now than it has been in nearly two years. The output during the month of January in the Pratt Mines division of the Tennessee Coal, Iron and Railroad Co. was larger than it ever was in one month. There is demand for every ton of coal that can be mined. The railroad car shortage and locomotive scarcity reported several weeks ago still hold in

this district. While the home consumption is heavy, there appears to be an increasing demand for coal from the outside. Considerable coal is being shipped into Mississippi and Louisiana while Mobile is receiving no small amount.

State Mine Inspector J. M. Gray is giving the duties of his office much attention. Maps received during the past month giving the operation for the year 1905 under ground in the coal fields in this State make a wonderful showing. The industry is being pushed to its utmost.

Coke is in strong demand with good prices prevailing.

Chicago. Feb. 5.

General conditions in the coal trade continue to be depressing. The cold waves of the last week produced good orders for a day or two, but have been too brief to affect the trade in a marked degree. Sales have become somewhat better also since the decision of the Indianapolis convention, the average consumer of coal being apprehensive of scarcity and higher prices as a result of the convention's action.

The fear of a strike, indeed, seems likely to stimulate sales greatly, of both anthracite and bituminous coals. Many wholesalers today have been figuring with customers on the possibilities of laying in stocks that will last as long as possible after April 1.

Aside from the strike feature and the temporary waves of sales due to cold weather there is no improvement in the coal market. Prices continue very low on Illinois and Indiana coals and supplies superabundant. Eastern coals are in slightly better condition, smokeless and Hocking showing a tendency to strength due to decreased shipments, but prices are still under circular figures. Anthracite is in better demand than for several weeks, but the total of sales to date is small.

Cleveland. Feb. 6.

The coal trade has been down and up during the past week, prices being regulated in the main by the car supply. During the first part of last week Cleveland's supply was unusually heavy, and it became necessary for the shippers to unload on the market at whatever price the material would bring, to save car service charges. In this they were embarrassed by the fact that consumers had already loaded up and had no further storage room. The result of the stress was that run-of-mine steam coal sold for a while at 75c. at the mine, or $1.75 delivered. A little later in the week, when this surplus had been worked off, the prices advanced and run-of-mine coal sold at 90c. at the mines. The appearance of a snowstorm in the meantime promises to shorten the supply, hence for the minute the market is strong. In addition, miners are not producing heavily at present. They prefer that, in the event of a strike, the mines shall not have a surplus in stock that will stand a long demand. The restriction of the supply of mine labor is shortening the supply and is consequently giving another cause for strength.

The domestic coal situation is also strong, due in the main to the fact that many of the mines have been closed recently, and now to the fact that the car supply is short. The prices hold on the basis of $2.25 at the mines for selected Massillon lump.

The coke market has been weak, but shows signs of getting firmer with the appearance of bad weather. The best grades of 72-hour foundry coke are selling at $3@$3.25 at the oven, and the best grades of furnace coke are selling at $2.25@$2.50 at the oven.

Pittsburg. Feb. 6.

Coal—The probability of a general suspension on March 31 has had the effect of stiffening the market and no low-price contracts were made this week. Run-of-mine coal is quoted at $1@$1.10 a ton at the mine. All the mines in the district were in operation yesterday, but it is not expected that the supply of railroad cars will be kept up all week, owing to the severe weather. The district convention of coal miners reassembled yesterday to complete the business pending when an adjournment was taken on Jan. 13 to permit delegates to go to the national convention at Indianapolis. The action of the convention in demanding an advance of 12% in the bituminous fields was unanimously approved. President Patrick Dolan was condemned by the district convention for voting in the joint conference with the operators for a continuation of the present mining rate. Dolan stood alone in the matter and an effort was made in the national convention to expel him from the organization, but the resolution was laid upon the table, with the understanding that the district convention would take action. The members of the union in the Pittsburg district are almost unanimous for a strike for the proposed advance and are assured that the non-union men will join in the movement. According to the decision of the national convention an agreement cannot be signed in any district until a settlement has been made for the entire country, in both the bituminous and anthracite fields.

Connellsville Coke—There was a slight falling off, in both production and shipment, and prices are lower. Furnace coke is quoted at $2.20@$2.30 and foundry at $2.85@$3.10 a ton. The production for the week was 283,370 tons and the shipments aggregated 11,920 cars, distributed as follows: To Pittsburg and river points, 4317 cars; to points west of Pittsburg, 6357 cars; to points east of Everson, 1246 cars. The combined shipments from the Connellsville and Masontown fields amounted to 348,211 tons.

San Francisco. Feb. 1.

For coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, $8; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car lots quotations are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, $8.50. Eastern coals are nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

Foreign Coal Trade.

Feb. 7.

Exports of coal and coke from the United States for the year are reported by the Bureau of Statistics of the Department of Commerce and Labor as below, in tons:

	1904.	1905.	Changes.
Anthracite	2,228,392	2,229,983	I. 1,591
Bituminous	6,345,126	6,959,265	I. 614,139
Total coal	8,573,518	9,189 248	I. 615,730
Coke	523,090	599,054	I. 75,964
Total	9,096,608	9,788,302	I. 691,694

The coke went to Mexico and Canada; the coal exports were distributed as follows:

	1904.	1905.	Changes.
Canada	6,577,954	6,964.630	I. 386,676
Mexico	880,747	927,170	I. 46,423
Cuba	519,227	564,385	I. 45,158
Other W. Indies	253,585	300,776	I. 47,191
France	10,948	4,554	D. 6,394
Italy	69,930	68,369	D. 1,561
Other Europe	63,476	28,354	D. 35,122
Other countries	197,651	331,010	I. 133,359
Total	8,573,518	9,189,248	I. 615,730

The coal to other countries goes chiefly to South America. The exports to Canada in detail were:

	1904.	1905.	Changes.
Anthracite	2,193,746	2,187,450	D. 6,296
Bituminous	4,384,208	4,777,180	I. 392,972
Total	6,577,954	6,964,630	I. 386,676

In 1905 Canada took 98.1% of the anthracite and 75.8% of all the coal exported.

Imports of coal and coke into the United States for the year are reported as follows:

	1904.	1905.	Changes.
Canada	1,211,304	1,331,292	I. 119,988
Mexico	221	40	D. 181
Great Britain	135,292	94,600	D. 40,692
Other Europe	601	395	D. 206
Australia	235,069	184,426	D. 50,643
Japan	45,429	41,956	D. 3,473
Other countries	759	134	D. 625
Total coal	1,628,675	1,652,843	I. 24,168
Coke	.....	86,091	.....

Coke was not reported separately last year. With the exception of a small quantity from Germany it comes from British Columbia. Most of the coal from Canada is also from British Columbia and is delivered on the Pacific coast; but some of it is Nova Scotia coal, which comes chiefly to Boston. Of the coal imported in 1905 there were 34,262 tons classed as anthracite.

Iron Trade Review.

NEW YORK, Feb. 7.

There has been no material change in the iron and steel markets during the week. In pig iron the only point to be noted is comparative quiet; there has been little new buying. This is partly because most large consumers are well provided; but partly also because some buyers look for concessions in prices on second and third quarter deliveries. It is possible that these may be made later, but there are few present indications. The statement of pig-iron production in 1905 will be found on another page.

In finished material, the rush for structural material and plates continues. There seems to be no end to the building plans which are coming forward, and it looks as if some of these would have to wait for the material. Probably there was never a time when the structural mills were so full of work.

Exports and Imports.—Exports of iron and steel—including machinery—from the United States for December and the year are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1904.	1905.	Changes.
December.....	$ 10,399,308	$ 13,986,261	I. $ 3,586,953
Year.....	128,455,613	142,928,513	I. 14,472,900

The increase in December was 48%; for for the year, 11.3%. The more important items of the iron and steel exports for the year were, in long tons:

	1904.	1905.	Changes.
Pig iron.....	49,025	49,221	I. 196
Billets, blooms, etc.....	314 314	237,638	D. 76,686
Bars.....	52,477	51,870	D. 3,607
Rails..	414,845	295,023	D. 119,822
Sheets and plates.....	55,204	75,034	I. 19,830
Structural steel.....	55,514	83,193	I. 27,679
Wire.....	118,612	142,611	I. 23,999
Wire-rods.....	20,073	6,514	D. 13,559
Nails and spikes.....	45,112	47,756	I. 2,644

Exports of pipe and fittings, not reported separately in 1904, were valued at $8,293,816 in 1905. The more important exports of rails in 1905 were 124,632 tons to South America, and 55,682 tons to Mexico.

Imports of iron and steel—including machinery—into the United States for December and the year are valued by the Bureau as below:

	1904.	1905.	Changes.
December.....	$ 1,675,889	$ 2,479,781	I. $ 803,892
Year.....	21,621,970	26,392,728	I. 4,770,758

The increase in December was 48%; for the year it was 22.1%. The more important items of the iron and steel imports for the year were, in long tons:

	1904.	1905.	Changes.
Pig iron.....	79,510	212,465	I. 132,965
Billets, blooms, etc.....	10,807	14,637	I. 3,830
Scrap iron and steel.....	13,461	23,731	I. 10,270
Bars.....	20,905	37,298	I. 16,393
Rails.....	37,776	17,278	D. 10,498
Wire-rods.....	16 206	17,616	I. 11,410
Tin plates.....	71,304	65 740	D. 5,564

The imports of pig iron and steel billets showed considerable increases last year; but they were far below those of 1903, the totals in that year being 599,574 tons of pig iron and 261,570 tons of billets and blooms.

Iron Ore Movement.—Exports of iron ore from the United States for the full year were 213,865 tons in 1904, and 208,058 tons in 1905; a decrease of 5,807 tons These exports were chiefly to Canada.

Imports of iron ore into the United States for the full year were 487,613 tons in 1904, and 845,651 tons in 1905; an increase of 358,038 tons. The imports were largely from Cuba, but ores were also received from Canada, Newfoundland and Spain.

Imports of manganese ore were 108,519 tons in 1904, and 257,033 tons in 1905; an increase of 148,574 tons.

Birmingham. Feb. 5.

Alabama furnacemen state that while prices are off a little the market as a general proposition is satisfactory. There is yet a scarcity of No. 2 foundry iron, spot delivery. The quotations right now are on a basis of $14 per ton, No. 2 foundry, in lots ranging 500 tons and better and with some time given for delivery. Smaller lots are still holding at $14.50 per ton. The inquiry is steady and some few sales are being made. The probable make has been well disposed of for February and March and the order books are beginning to fill well for the second quarter. The delivery is still strong, notwithstanding the lack of locomotive power on the railroads.

The iron production in Alabama holds its own; preparations are being made for the blowing in of three furnaces at least. The good weather has much to do with the steady iron production, there being no interference whatsoever with the work at the ore and coal mines.

The following quotations are given: No. 1 foundry, $14.50@$15; No. 2 foundry, $14@$14.50; No. 3 foundry, $13.50; No. 4 foundry, $13; gray forge, $12@$12.50; No. 1 soft, $15; No. 2 soft, $14@$14.50.

Finished iron and steel show no change in this section. There is steady operation at the rolling mills and steel plants. Work has started already in rebuilding the nail mill of the Southern Steel Co., formerly the Alabama Steel & Wire Co., which was destroyed by fire at Ensley recently. The rumor prevails that the Southern Steel Co. has under consideration the erection of a large plant for the manufacture of steel into merchantable shape, either at Gadsden or Ensley, Ala.

The plant of the American Cast Iron Pipe Co., at North Birmingham is now nearing completion. J. H. Hoadley, president of the International Power Co., which holds the controlling interest in the Alabama Consolidated Coal & Iron Co., announces that the control of that company is not for sale.

Chicago. Feb. 5.

The iron market remains quiet and there are signs of impending weakness of prices as regards pig iron. Southern No. 2 is still quoted at $14.50 Birmingham, or $18.15 Chicago; but it is generally understood that this price has been cut 25@50c. on business of the last week. Sales have been chiefly for small quantities to be delivered speedily, and on this business the market quotations prevail, with slight bonuses in some cases. Contract business is for the second quarter of the year mainly, though some lots for delivery in the third quarter are being contracted for. These long-term contracts mostly relate to Northern iron, Southern being the favorite on the short-time sales. Northern brings $19@$19.50 for No. 2 foundry.

With the needs of foundrymen unchecked and the general prosperity of the country apparently assured for the next six months, the local iron trade professes belief in an early revival of brisk buying of pig iron. The present seems a waiting period, which will end suddenly with a sharp advance of prices, as soon as users of iron conclude that they can wait no longer, but must cover their needs for at least the first half of the year.

Cleveland. Feb. 6.

Iron Ore—The ore market is quiet for the time, no new sales and no new contracts for transportation being reported. Interest centers principally in the labor situation, where there are possibilities of demands being made by the longshoremen for more men on the automatic machines, and by the lake pilots for recognition of their union, which will tie up the lakes, even after the ice is gone. Prices hold as they have been, at $4.25 for bessemer Old Range, as a basis, f.o.b. Lake Erie docks.

Pig Iron—Buying for the minute is quiet and is expected to remain so during the next few weeks. The furnaces are so well sold up that there is no need for them to urge material on the market. Buyers are holding off, expecting lower prices. The two situations make for a quiet market Prices are a little easier, although no breaks have occurred. The quotation is still $17.50 in the Valleys for No. 2, but this is nominal.

Finished Material—The market has been a little more quiet. Mills are busy on unfilled orders, against which specifications have been unusually heavy. New business does not seem to be coming in as freely as had been expected. The best buying seems to be in sheets, where the mills are overflowing with orders, resulting in a good demand upon the jobbers. The demand for plates is such that some of the smaller consumers, on lots of 100 to 200 tons, are paying premiums at times reaching $4 a ton. The demand for structural is also good, consumption being heavy, despite the winter weather. Billets are a little easier in tone, although the supply is not materially increased.

New York Feb. 7.

Business is quieter upon the whole. The chief demand just now seems to be for building and electric railroad material.

Pig Iron.—Buying has been rather light, most foundries being, apparently, supplied for the present. The chief inquiry has been for basic and the lower grades of foundry iron.

Prices for Northern iron are unchanged. For large lots we quote; No. 1X, $19@$19.50; No. 2X, $18.50@$18.75; No. 2 plain, $17.75@$18.25; gray forge, $17@$17.25. Virginia foundry is held at $18.60@$19.10 for No. 1, and $18.10@$18.60 for No. 2. Basic is $18.75 for Alabama, and 25c. less for Northern. For Southern iron on dock, quotations are: No. 1, foundry, $18.75; No. 2, $18.25; No. 3, $17.50; No. 4, $17; No. 1 soft, $18.75; No. 2 soft, $18.25; gray forge, $16.50. The railroads have advanced freights on Alabama iron 25c., to date from March 1; but it is probable this will be met by a drop of 25c. in Birmingham prices.

Business in warrants has been dull, and prices uneven.

Cast-Iron Pipe.—Prices are steady, the present basis being $29.75 per net ton for 6-in. pipe in carload lots at tidewater points. The foundries are all busy.

Bars.—Business is fair and prices unchanged. Mills are asking 1.895@1.945 for common bars and 1.95@2c. for refined bars in large lots at tidewater. Steel bars are 1.745@1.795c., same delivery. Store trade is a little slower at 2.25@2.50c., delivered.

Plates.—Steel plates are in fair demand. Tank plates are nominally 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745@1.845c.; according to width. Boiler makers are generally busy in this district.

Structural Material.—Orders continue to come forward for building work. Prices are nominally unchanged. Beams under 15-in. are 1.845c. for large lots; over 15-in. 1.895c.; angles and channels, 1.845c., tidewater delivery. Premiums are asked, if special deliveries are wanted, and jobbers ask a considerable advance on small orders.

Steel Rails.—No change in standard sections. Light rails are in steady demand, prices ranging from $26 for 35 lb., up to $33 for 12 lb. rails. Orders for trolley rails are still coming.

Philadelphia. Feb. 7.

Pig Iron.—The prospects of a coal strike are already exerting indirect influence upon the iron trade in this territory. The accumulation of fuel is the first point, but the possibility of a scarcity of iron during the second quarter of the year has influenced the closing of some negotiations for pig iron which have been hanging fire. There have been some indications of a possible break in prices, but strike possibilities have influenced quotations, and today's figures are stronger than 10 days ago. Considerable foreign iron is within reach and some transactions will be announced, probably in a few days. There is difficulty in obtaining assured promises for delivery on basic irons and two or three large transactions have been closed within a short time. There is also some business in forge iron at the outside figure, and inquiries at Virginia furnaces show that they are in no disposition to make new contracts just at this time. Quotations are $19.50 for No. 1X foundry; $18.50@$19 for No. 2; $17.50@$18 for No. 2 plain; $18.50@$19 for No. 2 Southern; $18 for basic; $25 for low phosphorus and $19 for malleable iron.

Steel Billets.—The activity in billets continues and some extensive transactions are on the point of being closed. The nominal quotations are $29 delivered and for foregoing billets the average quotation is not far from $36.

Muck Bars.—Small sales have been made at $30, but little business has been booked.

Bars — Most business for the past week has been in steel bars, the average price being 1.63½. The mills are fairly well oversold.

Sheets.—The absence of business on a large scale is no indication of weakness but rather of the indifference of the manufacturers as to booking further business just at this time.

Merchant Steel.—As the winter progresses the actual consumption of merchant steel seems to increase, while on the other hand the placing of orders is not heard of so often. Mill quotations are firm.

Pittsburg. Feb. 6.

Sales of pig iron for the week were lighter that at any time since the opening of the year, but the market continues strong for bessemer. The furnaces are sold up for the first quarter and according to reports there is but little iron available for second quarter. Owing to the remarkable production and shipment of coke, prices have declined fully 75c. a ton from the rate expected when pig-iron prices for the second quarter were made. This fact is responsible for a report that when contracts for bessemer iron were taken at $17.75, Valley furnaces, for second quarter, they were guaranteed against a reduction, including the big purchase made by the United States Steel Corporation. No confirmation, however, has been obtained, and as the first real cold weather of the winter reached this region on Saturday, it is believed coke prices will stiffen again and pig-iron contracts will not be affected. The Steel Corporation has not closed for any additional second-quarter bessemer and it is now believed the intended purchase of 40,000 to 50,000 tons will be deferred. Foundry and forge iron is easier, but there has been no decided decline in prices. It has just been announced that the Standard Sanitary Manufacturing Co. was in the market a week or two ago and bought 10,000 tons of Northern foundry No. 2 for the Allegheny and New Brighton plants, and 4000 or 5000 tons of Southern foundry for its Louisville works. The price was not officially given, but it is said to be about $17.25, Valley, for the northern iron. Pig-iron production is now at the highest point ever reached, and according to reliable reports the production in January was about 2,100,000 tons, or at the rate of 25,000,000 tons a year. Corrigan, McKinney & Co. put their Scottdale furnace in blast last week and every furnace in the Pittsburg and surrounding districts that is in shape for operation is now running. Southern iron is weaker, but none has been bought here this week. The freight rate from Birmingham to this market will be advanced on March 1 from $4.35 to $4.60 a ton. January broke all records for shipment from the Valley furnaces; not a ton of bessemer iron has been stored, and but little foundry and forge was produced that was not under contract. While ferro-manganese is still very scarce abnormal prices have disappeared. One sale of a small lot was made yesterday for spot shipment at $110 a ton, but quotations for foreign 80% range from $125 to $140 a ton.

The steel market continues very strong, although there have been no sales of any consequence during the week. Specifications are being freely made in nearly all of the finished lines, and all stocks are lower than usual, indicating a heavy consumption. Wire and wire products are in great demand and an advance in prices is expected to be announced at any time. Merchant pipe also is expected to be higher in a short time. Iron bars are quoted at 1.80c., but this is not regarded as weakness, as the 2c. quotation recently withdrawn by the Republic Iron and Steel Co. was not warranted. Steel bars are remarkably firm and premiums are paid frequently for prompt shipment. The steel-rail trade is unprecedented and new business is being placed every week. Orders aggregating over 80,000 tons have been booked within the past 10 days, and according to official figures a total of over 2,500,000 tons is under contract for delivery this year. The demand for structural material has been heavy, despite the fact that mills cannot guarantee delivery before the third quarter. While contracts were not placed, arrangements have been practically made for a large tonnage of structural material for delivery in 1907, and include over 6000 tons for a skyscraper to be erected in the downtown section of Pittsburg on a site that will not be available before April of next year. The American Sheet and Tin Plate Co. has added a few more idle mills to the active list and would have all running but for the scarcity of steel. The demand for

sheets and tin-plate keeps up, principally in specifications on old contracts. Some independent sheet and tin-plate concerns are unable to operate their plants owing to inability to get steel. The old project of erecting a steel plant has been revived and it is said John Warner, of Struthers, O., is the promoter. It is proposed to interest the independents in the enterprise. One of the surprising reports of the week is that the leading interest is behind on its contracts with allied and other consuming interests about 25,000 tons of sheet-bars and 75,000 tons of billets.

Pig Iron—No sales of any consequence were made during the past week. Bessemer iron is quoted at $17.50@$17.75, Valley, basic at $17.25, Valley, foundry No. 2 at $17.25, Valley, and gray forge at $17.35, Pittsburg.

Steel—Billets and sheet-bars are still very scarce and prices are at the highest point in several months. Bessemer billets are quoted at $27@$28, open-hearth billets at $28 and sheet-bars are nominally $27. Steel bars remain at 1.50c. and plates at 1.60c.

Sheets—The market is strong and black sheets are quoted at 2.40c. and galvanized at 3.45c. for No. 28 gauge.

Ferro-Manganese—One small lot of 80% was sold this week at $110 a ton, but quotations are still made at $130@$140 for first half delivery.

Cartagena, Spain. Jan. 8.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 2400 tons dry ore; four cargoes, 12,200 tons manganiferous ore, and one cargo, 3300 tons Colorado ore, all to Great Britain; one cargo, 5100 tons Calasperra ore, to Rotterdam. The market continues good. Forward buyers are very strong, but in most cases sellers are declining to quote for forward delivery, as any change in the prices, it seems practically certain, will be in an upward direction. The continued and steady fall in the rate of exchange is the only unfavorable feature in the present position of the market. Tonnage rates continue favorable to charterers.

Quotations range a little higher. Ordinary 50 per cent. ore is 7s. 11d.@8s. 3d.; special low phosphorus, 8s. 6d.@8s. 9d.; special low ore, 58 per cent. iron, 11s. 3d.; S. P. campanil, 9s. 9d. All prices are f.o.b. shipping port. Manganiferous ores, same terms, range from 11s. for 35 per cent. iron and 12 manganese, up to 17s. 9d. for 20 iron and 20 per cent. manganese.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted 10s. 3d. per ton, f.o.b. Cartagena.

Heavy Chemicals and Minerals

New York, Feb. 7.

Nitrate of Soda.—Imports to Atlantic ports in Jan., 1906, were 26,000 tons; stock on hand Jan. 1, 1906, 13,100 tons; stock in store, and afloat shortly to arrive (making visible supply to May 15, 1906), 102,300 tons; deliveries in Jan., 1906, 27,900 tons.

Heavy chemicals show little material change, though, in general, there is a tendency for the markets to become stronger. Figures for tin bichloride and crystals for the month are included in the prices given in the following table:

PRICES.

Acids.		
Boric, crystals	per lb.	.10
powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.05
48%	"	.05
60%	"	.11
Nitric acid, 36°, 100 lb	"	$4.75
38°, 100 lb	"	5.25
40°, 100 lb	"	5.50
42°, 100 lb	"	5.75
Oxalic acid, com'l, 100 lb		$5.00@5.25
Sulphuric acid, 50°, bulk, ton		13.50@14.50
60°, 100 lb. in carboys		1.00
60°, bulk, ton		18.00@20.00
66°, 100 lb. in carboys		1.25
66°, bulk, ton		21.00@23.02
Blue Stone (Copper Sulphate), carload lots, per 100 lb		5.90@ 6.05
Nitrate of Soda, 100 lb. 96% spot $2.25; future $2.22½		
Sulphate of Ammonia, per 100 lb		3.10@ 3.15
Sulphur.		
Louisiana to New York, Boston or Portland	ton	$22.12½
To Philadelphia or Baltimore	"	22.62½
Tin, bichloride per lb		.11
Crystals, per lb		.22½
Pyrite.		
Domestic, furnace size	Unit	11c.
Fines	"	10c.
Imported, lump, At. ports	"	10@11c.
" fines " "	"	9½@10c.
" furnace size	"	11½@12c.

Pyrite prices are per unit of sulphur. On lump deliveries, a charge of 25c. per ton is made for breaking to furnace size.

Phosphates.	F. o. b.	C. I. F. Gt. Britain. or Europe
*Fla., hard rock	$7.75@8.00	$10.90@12.10
land pebble	4.00@4.25	7.95@ 8.65
†Tenn., 78@80%	4.60@4.65	.....
78%	4.00@4.25	.....
75%	3.65@3.75	.....
68@72%	3.25@3.50	.....
‡So. Car. land rock	4.00@4.25	.....
river rock	3.75@4.00	.....

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Foreign Chemical Trade—The imports of heavy chemicals into the United States for the year were as follows, in pounds:

	1904.	1905.
Potash muriate	174,865,872	214,207,064
Potash chlorate	95,889	42,510
Potash nitrate	14,184,287	9,911,534
Other potash salts	74,720,241	82,935,632
Caustic soda	2,570,984	2,245,789
Sal soda	4,307,728	1,947,230
Soda ash	19,324,104	13,807,749
Other soda salts	10,389,711	11 257,629
Bleaching powder	87,909,168	104,919,462

There was an increase in bleach, but decreases in most of the soda salts. Imports of sulphur and of pyrites, valued chiefly for their sulphur contents, were, in long tons:

	1904.	1905.	Changes.
Sulphur	128,885	83,201	D. 45,684
Pyrites	413,585	515,722	I. 102,137

Estimating the sulphur contents of pyrites, the total imports of sulphur in 1905 were approximately 290,000 tons. The imports of fertilizing chemicals were, in long tons:

	1904.	1905.	Changes.
Phosphates	130,214	56,021	D. 74,193
Nitrate of soda	228,012	321,231	I. 103,019

There was a large increase in nitrate of soda last year.

Exports of phosphates and of the more important chemicals from the United States for the year were as follows:

	1904.	1905.
Copper sulphate, lb	26,422,748	19,367,179
Acetate of lime, lb	55,909 430	70,816,382
Phosphates, tons	868,033	957,805

The larger exports of phosphates were 294,690 tons to Germany; 145,405 tons to Great Britain; 130,292 tons to Italy; 113,-81 tons to France.

Metal Market.

New York, Feb. 7.

Gold and Silver Exports and Imports.

At all United States Ports in Dec. and Year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1905	$2,668,532	$3,982,040	Imp. $1,313,508
" 1904	13,502,827	3,336 184	Exp. 10,166,643
Year 1905	46,794,467	50,246,564	Imp. 3,452,097
" 1904	121,211,827	84,803,234	Exp. 36,408,593
Silver:			
Dec. 1905	8,196,149	4,646 789	Exp. 3,549,360
" 1904	4,114,661	2,252,955	" 1,861,706
Year 1905	57,513,102	35,892,196	" 21,620,906
" 1904	50,135,245	26,087,042	" 24,048,203

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending February 3, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 17 875	$ 22,991	$1,876,299	$ 14,214
1906	1,053,875	188,770	9,478,903	171,023
1905	23,897,883	349,885	3,480,103	78,668
1904	809,162	1,194 272	4,991,974	103,637

Exports of gold for the week were to West Indies; of silver to London. Imports, both gold and silver, were from the West Indies and Mexico.

A further shipment of $500,000 gold to Argentina has been made this week. There is talk of gold going to Paris, but none has yet been taken.

The statement of the New York banks—including all the banks represented in the clearing house—for the week ending Feb. 3, gives the following totals, comparison being made with the corresponding week of 1904.

	1905.	1906.
Loans and discounts	$1,128,086,800	$1,057,365,100
Deposits	1,196,980,300	1,061,402,108
Circulation	42,898,700	51,978,900
Specie	227,313,500	192,492,100
Legal tenders	91,773,500	83,986,300
Total Reserve	$319,087,000	$276,478,400
Legal requirements	299,245,075	265,350,775
Surplus	$19,841,925	$ 11,127,625

Changes for the week this year were increases of $16,251,800 in loans and $14,-290,500 in deposits; decreases of $514,300 in specie, $615,300 in legal tenders, $288,-500 in circulation and $4,702,225 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars.

	Gold.	Silver.	Total.
New York	.....	.....	$192,492,100
England	$163,808,650	.....	163,808,650
France	569,654,120	$210,938,250	780,592,370
Germany	178,920,000	59,640,000	238,560,000
Spain	75,230,000	116,090,000	191,320,000
Netherlands	33,032,500	30,605,500	63,638,000
Belgium	17,046,665	8,513,335	25,540,000
Italy	141,295,000	18,359,000	159,654,000
Russia	518,050,000	18,145,000	536,195,000
Austria	227,330,000	62,170,000	289,500,000

The returns of the Associated Banks of New York are of date Feb. 3, and the others Feb. 2. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to Jan. 25

	1905.	1906.	Changes.
India	£ 510,000	£ 1,615,700	I. £ 1,105,700
China	.....	.....	.....
Straits	2,800	.....	D. 2,800
Total	£ 512,800	£ 1,615,700	I. £ 1,102,900

Receipts for the week were £14,000 silver bars from the West Indies; £276,000 bars and £238,000 Mexican dollars from New York; a total of £528,000. Exports were £293,000 bars and £95,500 Mexican dollars; a total of £388,500, all to India.

Indian exchange has been steady, the Council bills offered in London having been taken at an average of 16.06d. per rupee. Shipments of silver to India continue large.

The silver market continues steady. Large supplies are being absorbed and tendency of the tone is still toward firmness. Mexico is refining and parting the Doré bars, which were formerly shipped, retaining the gold and forwarding to London the fine silver.

The average price of silver for January was given in our last issue as 65.269c. This was, unfortunately, a mistake of the proof-reader, the correct figure being 65.288c., as given on another page.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.50⅛	$0.51⅛
Peruvian soles and Chilean	0.46	0.47½
Victoria sovereigns	4.85½	4.87½
Twenty francs	3.86	3.88
Spanish 25 pesetas	4.78	4.80

SILVER AND STERLING EXCHANGE.

Feb.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Feb.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
1	4.87⅛	65⅛	30⅛	5	4.87⅜	65⅛	30 1/16
2	4.87⅛	65⅛	30⅛	6	4.87⅜	65⅝	30 1/16
3	4.87⅛	65⅛	30⅛	7	4.87¼	65⅝	30 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Other Metals.

Daily Prices of Metals in New York.

February	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
1	17⅞ @18⅛	17¾ @18	78⅛	36½	5.60	6.10	5.95
2	17⅞ @18⅛	17¾ @18	78¼	36⅝	5.60	6.10	5.95
3	17¾ @18	17¾ @17⅞	....	36⅝	5.60	6.10	5.95
5	17¾ @18	17¾ @17⅞	78 1/16	36½	5.60	6.05 @6.10	5.90 @5.95
6	17¾ @18	17⅝ @17⅞	76 13/16	36⅜	5.60	6.05 @6.10	5.90 @5.95
7	17¾ @18	17⅝ @17⅞	76 13/16	36¼	5.60	6.05 @6.10	5.90 @5.95

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations or electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper—Again a declining tendency has prevailed and prices have suffered somewhat more. Very little business is reported, although during the last few days there has been more inquiry. The market closes for lake copper 17¾@18c.; electrolytic in cakes, wirebars or ingots 17⅝@⅞; casting copper 17½@17⅝.

The speculative market in London was very flat and declined almost from day to day. Forward copper, which was specially pressed for sale, shows the greatest decline. The closing prices are £76 16s. 3d. for spot and £74 15s. for three months prompt.

Statistics for the second half of January show a decrease in the visible supplies of 200 tons.

Refined and manufactured sorts we quote: English tough, £82@£83; best selected, £83@£84; strong sheets, £89.

Copper Exports and Imports.—The exports of copper from the United States for the full year are reported as below by the Bureau of Statistics of the Department of Commerce and Labor; the figures here given being in long tons of 2,240 lb. each:

	1904.	1905.	Changes.
Great Britain	50,101	27,208	D. 22,893
Belgium	4,181	2,231	D. 1,950
France	44,593	33,306	D. 11,287
Italy	6,829	7,054	I. 225
Germany and Holland	112,279	105,023	D. 7,256
Russia	9,970	8,223	D. 1,747
Other Europe	12,975	11,285	D. 1,690
Canada	1,550	1,348	D. 202
China	4,644	35,687	I. 31,043
Other countries	445	7,433	I. 6,988
Total metal	247,567	238,798	D. 8,769
In ores and matte	4,874	5,227	I. 353
Total	252,441	244,025	D. 8,416

The total exports of ore and matte were 18,927 tons in 1904, and 37,688 tons in 1905; an increase of 18,701 tons. The contents are estimated chiefly on the basis of value. The increase in exports to China was the chief feature of the year; the European takings showed a considerable decrease. The imports in 1904 were extraordinary, however; in 1903 the total metal exported was 138,719 tons only.

Imports of copper and copper material into the United States for the year, with re-exports of foreign material, are reported as follows: the figures giving the equivalents of all material, in long tons of fine copper.

	Metal.	In ore, etc.	Totals.
Mexico	45,824	12,897	58,721
Canada	10,552	6,877	17,429
Great Britain	11,734	21	11,755
Other countries	3,595	2,573	6,168
Total imports	71,705	22,368	94,073
Re-exports	767	.....	767
Net imports, 1905	70,938	22,368	93,306
Net imports, 1904	63,954	17,387	81,341

The total increase in net imports was 11,965 tons, or 14.7%. The excess of exports over imports in 1905 was 150,719 tons. Imports of ore and matte from Mexico in 1905 were 98,263 tons, containing 12,897 tons copper; from Canada and Newfoundland, 176,186 tons, containing 6,877 tons copper. The imports of ore and matte from South America were 3,662 tons, containing 671 tons copper.

Tin—The scarcity of spot tin, which had existed for some little while, has been relieved by the arrival of a large shipment, and the quotations here follow closely the trend of the London market. The latter, which opened firm at £166 15d. @£167, has gradually declined and closes at £164 7s. 6d. for spot and £163 for three months prompt. Prices here are quoted at 36@36.25c., depending upon deliveries.

Statistics for the month of January show an increase in the visible supplies of 1100 tons.

Imports of tin into the United States for the full year are reported as follows, the figures being given in long tons:

	1904.	1905.	Changes.
Straits	16,010	18,503	I. 2,493
Australia	286	601	I. 315
Great Britain	19,726	19,399	D. 327
Holland	693	459	D. 234
Other Europe	386	819	I. 433
Other countries	28	53	I. 25
Total	37,129	39,834	I. 2,705

The visible stocks of tin on February 1 are reported as follows, in long tons:

	Store.	Afloat.	Total.
Great Britain	2,033	4,100	6,133
Holland	1,995	137	2,132
U. S., exc. Pacific ports	1,251	4,770	6,021
Total	5,279	9,007	14,286

The total showed an increase of 835 tons over that reported on January 1.

Lead—The market remains very dull and quiet, with very little business doing; at unchanged prices.

The London market, which toward the end of last week became a little firmer, with the quotations at £16 10d., is again

very dull and quoted at the close at £16 5d. for Spanish and £16 7s. 6d. for English lead.

Imports of lead into the United States for the full year, with re-exports of imported metal, are as follows, the figures given being in short tons of 2000 lb.:

	1904.	1905.	Changes.
Lead, metallic	8,724	5,720	D. 3,004
Lead in ore and base bullion	104,128	92,658	D. 11,470
Total imports	112,852	98,378	D. 14,474
Re-exports	83,887	59,456	D. 24,431
Net imports	28,965	38,922	I. 9,957

Of the imports in 1905 Mexico supplied 87,584 tons and Canada 8181 tons. Exports of domestic lead were 255 tons in 1904 and 285 tons in 1905; an increase of 30 tons.

St. Louis Lead Market—The John Wahl Commission Co. reports on Feb. 3 as follows: Receipts amounted to 29,865 pigs, an increase of 2700 pigs over previous week. Metal in limited demand and easy, on basis of 5.55c. Today offers were made at 5.52½c., but no sales reported.

The company telegraphs us on Feb. 7 as follows: Lead is firm, but quiet, at the late decline. The latest sales are on a basis of 5.52½, East St. Louis.

Spanish Lead Market.—Messrs. Barrington & Holt write from Cartagena, Spain, under date of Jan. 20, that silver has been 14.75 reales per ounce. Exchange is 31.12 pesetas to £1. Pig lead has been 87.25 reales per quintal; equal, on current exchange, to £16 9s. 10d. per long ton, f. o. b. Cartagena. Exports for the week were 183 tons argentiferous lead to London.

Spelter—The small business which has been done was at declining prices. Very little disposition was shown on the part of consumers to enter the market, and the close is weak at 6.05@6.10 New York and 5.90@5.95c. St. Louis.

The London market has been very unsettled and closes at £26 17s. 6d. after business had been done at £26 10s.

Exports of spelter from the United States for the full year were 10,072 short tons in 1904 and 5516 tons in 1905; a decrease of 4556 tons. Exports of zinc ores were 32,063 tons in 1904 and 27,630 tons in 1905; a decrease of 4433 tons. Exports of zinc dross were 5318 tons in 1905; in the previous year these exports were not reported.

St. Louis Spelter Market—The John Wahl Commission Co. on Feb. 3 reports as follows: Receipts 61,750 slabs, an increase of 10,680 slabs over previous week. The market has been demoralized, with offers at 6c. down to 5.95c. Today metal is offered at 5.92½c., with no takers.

The company telegraphs us on Feb. 7 as follows: Spelter, although appearing slightly unsettled, is reasonably firm. Latest sales are on a basis of 6c., East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 20, that prices are nominally unchanged at 95 fr. for blende, 35% zinc, and 72 fr. for calamine, 30% zinc. The market is weak, owing to the fall in spelter and the decline in exchange. Exports were 506 tons blende to Swansea.

Zinc Sheets.—The price of zinc sheets has been reduced to $7.75 per 100 lb. (less discount of 8%). f. o. b. cars Lasalle and Peru, in 600-lb. casks, for gauges No. 9 and 22, both inclusive, widths from 32 to 60 in., both inclusive, and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since January 1, 1905, have been as follows: December 30, 1904, $7.25; January 7, 1905, $7.50; May 12, $7.25; June 1, $7; July 29, $7.25; August 10, $7.50; December 1, $7.75; January 6, 1906, $8; Feb. 5, $7.75.

Antimony—No change is reported.

Imports of antimony into the United States for the full year are reported as follows, in pounds:

	1904.	1905.	Changes.
Metal and regulus	4,036 299	5,837,891	I. 1,781,592
Antimony ore	2,487,602	1,976,694	D. 510,908

This shows an increase of 43.9% in metal, but a decrease of 20.5% in ore imports.

Nickel—Quotations for large lots, New York, or other parallel delivery, are 40@47c. per lb., according to size and condition of order. For small quantities, prices range from 48 up to 60c., also according to size or order and deliveries.

Exports of nickel, nickel oxide and nickel matte from the United States for the full year were 7,519,206 lb. in 1904, and 9,550,918 lb. in 1905; an increase of 2,031,712 lb. Imports of nickel ore and matte were 8549 tons in 1904 and 13,451 tons in 1905; an increase of 4902 tons.

Platinum—Prices of this metal are unsettled, owing to short supplies, and the present unfortunate conditions in Russia making shipments from that country uncertain. Today prices are as high as $25 per ounce, but changes are likely to continue.

Imports of platinum into the United States for the full year were 7118 lb. in 1904 and 7145 lb. in 1905; an increase of 27 lb. only.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to $43.50@$44 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is £7 7s. 6d. per flask, but jobbers ask £7 10s. for moderate lots.

Exports of quicksilver from the United States for the full year were 1,611,635 lb. in 1904 and 1,009,446 lb. in 1905; a decrease of 602,189 lb., or 37.4%, last year.

Manganese Alloys—Prices for these alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 50 kg. delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese copper, No. 1, 30% Mn	275
No. 2, 28% Mn	180
No. 3, 20 to 25%, with 2 to 4% iron	165
Manganese tin, No. 1, 55% Mn., no iron	480
No. 2, 56% Mn., some iron	280
Manganese nickel, No. 1, free from iron	450
No. 2, traces of iron	270

Manganese metal is quoted as 3 marks per kg.—38.8c. per lb.—delivered in Bremen. These alloys are made by the Isabellenhütte, in Bonn, Germany, which is represented by Mr. Speier in Breslau as selling agent.

Minor Metals—For minor metals and their alloys, wholesale prices are f. o. b. works:

Aluminum.	Per lb.
No. 1, 90% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled sheets	4c. up.
Aluminum-bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2 10
Cadmium, f. o. b Hamburg	77c.
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	95c.
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (75%)	12½c.
Ferro-Tungsten (37%)	29c.
Magnesium, pure (N. Y.)	$1·60
Manganese (98@98% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$1.75
Tantalic acid (N. Y.) (oz.)	49c.
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best), pound lots	90c.

Variations in price are chiefly due to size and conditions of order and deliveries.

Missouri Ore Market.

JOPLIN, Feb. 3.

The highest price paid for zinc ore was $54 per ton, with the assay basis price ranging from $50 down to $45 per ton of 60% zinc. The average price was $46.60. Buying was strong and steady all week, but with no demonstration indicating active competition. In fact it was reported that buying was easier on a $48 basis at the end of the week than at the beginning, so quietly were the purchases made.

The highest price paid for lead ore is reported at $78.50@$79 per ton, information differing on this point. This is an advance of $3 per ton, but the bulk of ore was purchased without apparent competition at a price $3 per ton lower than last week. The St. Louis Smelting and Refining Co. and the Granby Mining and Smelting Co. were the principal competitors, and only two bins in Webb City are reported raised. The average price of the week was $72.52.

Following are the shipments of zinc and lead from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,220,060	294,660	$65,140
Carterville-Webb City	1,798,820	816,660	72,970
Galena-Empire	914,460	163,050	26,430
Duenweg	686,890	165,710	22,530
Badger	435,610	2,690	10,990
Aurora	520,200	.....	9,990
Alba	381,470	.....	9,530
Granby	412,000	25,000	7,450
Neck City	293,960	.....	7,350
Prosperity	174,920	55,770	5,970
Oronogo	186,750	26,940	5,480
Spurgeon	188,420	46,890	5,150
Sherwood	144,390	11,250	3,990
Carthage	149,320	.....	3,730
Central City	135,330	.....	3,050
Stott City	88,270	.....	2,110
Zincite	63,100	2,700	1,610
Totals	8,799 080	1,611,320	$263,470
Zinc value, the week, $205,030; 5 weeks, $1,157,025.			
Lead value, the week, 58,440; 5 weeks, 269,690.			
Last week	8,287,020	1,532,490	$253,140
Same week last year	6,576,320	750,860	199,240

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61 50	75.20
February	52.77	....	February	57.62	....
March	47.40	....	March	57.20	....
April	42.88	....	April	58.00	....
May	43.31	....	May	58.27	....
June	40.75	....	June	57.80	....
July	43.00	....	July	58.00	..
August	48.83	....	August	58.00	....
September	46.75	....	September	63.50	....
October	47.60	....	October	63.86	....
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Wisconsin Ore Market.

PLATTEVILLE, Feb. 3.

No change in the price of 60% zinc ore was reported, $50 being the price offered by nearly all the buyers. One lot was quite large and the extra amount of tonnage caused the buyer to raise the price to $51. Some choice lots brought as high as $53 and $54. It is reported that a new buyer of high-grade ore is in the field, attracted by the fine quality of ore being produced at the several mines that are equipped with roasters.

The camps in the Platteville district reported ore loaded as follows, in pounds:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	614 060	.....	... .
Benton	551,650	.....	.....
Cuba City	385,060	.....	.....
Linden	314,390	.....	.....
Buncombe-Hazel Green	240,500	.....	.....
Mineral Point	191,700	. ...	.....
Shullsburg	175 180	.....	.....
Livingston	90.000	.....	.....
Harker	65,400	.....	.....
Highland	60,000	.....	.....
Rewey	55,780	.....	.....
Montfort	.....	.. .	58,600
Total	2,743,720	.....	58,600
Year to date	7,924,150	203,000	1,621,240

The output from the Benton-Hazel Green and Buncombe camps will be materially cut down for some time. The camps just named shipped a large amount of ore this week, the Hazel Green furnishing a large part.

Lead ore for the past two months has been exceedingly scarce, in spite of the high prices. This would indicate ordinarily that the lead was practically worked out in this district, but this is not so; one of the reasons is that capital is paying more attention to the deeper mining, leaving the upper levels and lead mines to the small operator who gets a car occasionally. The total lead production from the Platteville district for the year 1905, amounted to 3,003 tons, valued in round figures at $100,000. A few carloads of lead ore were sold during the week, but not all loaded. The price reported was $53.50.

Mining Stocks.

New York. Feb. 7.

The stock market has been quieter than for many weeks, business as well as prices being off, and trading light by comparison, though still large. Amalgamated Copper was down to $113½, closing at $115; while Anaconda was off several points. On the outside market the coppers were less in demand. United Copper closed at $73 for the common and $102 for the preferred. Reports of a settlement between the Amalgamated and the Heinze people have been persistently circulated; and it is said that the Guggenheim interests are also coming into the supposed deal.

On the Consolidated Exchange there was the usual light trading in the Comstocks. In the Cripple Creek stocks Portland was quoted at $1.80; Isabella, 27c.; Moon-Anchor, 4½c. Among the miscellaneous shares, there were sales of 600 Alice at $3.75@$3.95. Sales of Tonopah stocks were moderate. Gold Anchor bringing $1.50; Jim Butler 69c. for 300 shares.

Standard Consolidated, of California, has declared a dividend of 10c. a share, the first for over two years.

The industrials, like the general stock list, were rather dull. United States Steel was $44 for the common and $112 for the preferred. Tennessee Coal, Iron and Railroad closed at $158½; Sloss-Sheffield, $88¾; American Smelting and Refining, $165 for the common and $126 for the preferred.

Boston. Feb. 6.

The continued talk of copper-mining combinations has had a noticeable effect on the share market. This week it has been Bingham Consolidated and United Copper mainly. The former, on very heavy trading, and in a manner that has been witnessed in other stocks in the East, has gone up steadily until it reached $48.-87½ today, against a close at $38.25 a week ago. Of course there is a reason for it, but none has been offered as yet that will stand the light of day. It is known, however, that the heaviest buying has come from New York. United Copper is up almost $14 to $67.87½ on reports of a settlement with the Amalgamated people, which will do away with the millions of dollars now in litigation.

Franklin mining and several other Lake Superior properties have also come into the limelight of speculation, which lends encouragement to the general situation. This stock reached $21.37½ today, closing $2.75 above a week ago at $20.25. It is known that the lower levels in Franklin are looking fine in the Junior property, but there are also whisperings that the dividends will be resumed, if conditions in the mine and in the metal market continue as they are. Atlantic has recovered $1.75 to $26.75; Tecumseh $2 to $15.50; Michigan $1 to $15.50; Isle Royale $1 to $25.50; Centennial $1 to $29; Allouez $1.50 to $42, and Adventure $1 to $6.50. The Michigan will be obliged to build its own mill in the fall, when the contract for the use of one head at the Mass mill expires. The January output at the Michigan was its biggest month.

Amalgamated touched $116.25 today which is its high point since 1901. Boston Consolidated came to life and easily touched $31, closing at $30 against $27.87½ a week back. Greene Consolidated has improved $2.25 to $28.25, now that the dividend question is out of the way; and Trinity shunted $2 to $11 on an expected deal to be made by its president, T. W. Lawson. Utah Consolidated is higher at $65.12½, and United States Smelting common is up over $2.50 to $61.62½, while the preferred has advanced $1.50 to $46. Copper Range, which was heavy last week, is now up $2.50 to $83.50, and Osceola $1.75 to $102. North Butte closed firm at $87.50.

No improvement is shown in the price of Shamon, which holds around $6.25, although President Gill has resigned and is to be succeeded by W. Palmer. The original Bingham Copper and Gold Mining Co. has been absorbed by its successor, the Bingham Consolidated, and the former company has been liquidated. Butte Copper Exploration is a new stock on the curb. After trading at $7.50 it is back to $5 today.

Colorado Springs. Feb. 2.

The past week has been one of unusual activity on the Exchange, and several stocks have experienced material advances, and with the volume of trading consideration heavier than usual. Jennie Sample, El Paso and Findley were the star actors. During the week Jennie jumped from 6 to 10 but reacted on today's market to 8½c. El Paso went up to 99 but closed today at 92¾c. Findley has advanced from 88½ to 95, but last sales recorded today were at 93c. Dante has made slight advances, closing today at 6⅞c. Elkton remains about normal around 46½c. Portland is selling from $1.85 to $1.90; Vindicator 88 to 90; Golden Cycle 80 to 82; United Gold Mines at 12½; Isabella 24½@24⅞c. On Thursday a total of 165,000 shares of Jennie Sample changed hands.

The total production for the Cripple Creek district for the month of January amounts to $1,838,400.

Findley is paying its 2c. dividend, which brings up the total amount paid in dividends to $237,000.

San Francisco. Feb. 1.

Dealings in the Comstocks were a little more lively than usual early in the week, but quieted down later on a rather higher range of prices. Ophir sold at $6.37½ Consolidated California & Virginia, $1.30; Best & Belcher, $1.15; Sierra Nevada, 37c. per share.

The Tonopahs also quieted down a little, though business was still active. The market was strong, but the boom has gone off a little. Montana Tonopah sold at $2.75; Red Top, $2; Tonopah Midway, $1.95; Sandstorm, $1.45; Gold Anchor, $1.40; McNamara, 50c. per share.

Oil stocks continue dull and quiet. Caribou was quoted at $6.75, while 60c. was bid for Toltec.

Dividends.

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	Feb. 26	$1.50	$2,296,319
Findley	Feb. 1	0.02	25,000
General Asphalt, pfd.	Mch. 1	2.00	262,800
Greene Con. Copper	Feb. 28	0.40	345,600
International Salt	Mch. 1	1.00	187,500
Standard Con., Cal	Feb. 23	0.10	18,394
U. S. Steel, pfd	Feb. 28	1.75	6,304,919

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alpha Con.	Jan. 31	Feb. 21	$0.05
Apollo Con	Feb. 19	.....	0.10
Belcher	Feb. 14	Mar. 7	0.10
Best & Belcher	Feb. 9	Feb. 28	0.10
Butler Liberal, Utah	.....	.....	0.02
Caledonia	Feb. 16	Mar. 9	0.10
Con. Cal & Virginia	Feb. 13	Mar. 6	0.25
Con. Imperial	Feb. 14	Mar. 13	0 01
Dutch, Cal.	Feb. 27	.....	0.08
Exchequer	Feb. 14	Mar. 7	0.05
Fair View, Cal.	Feb. 12	.....	0.10
Justice	Feb. 27	Mar. 19	0.05
Lady Washington	Jan. 20	Feb. 10	0.05
Mexican	Feb. 7	Feb. 28	0.15
Mt. Pleasant Con.	Jan. 29	Feb. 12	0.03
Providence, Utah	Feb. 5	Mar. 12	0.00½
Potosi	Feb. 5	Feb. 27	0.10
St. John Quartz	Jan. 27	.....	0.05½
Sierra Nevada	Jan. 22	Feb. 12	0.10
Union Con.	Jan. 25	Feb. 15	0.10
Vespasian-Hoogley	Feb. 12	Feb. 28	0.012
Zeibright, Cal.	Feb. 14	.....	0.05

St. Louis. Feb. 6.

	High.	Low.
Adams	$ .40	$ .25
American Nettie	.15	.12
Center Creek	2.60	2.40
Central Coal & Coke	62.00	61.50
" " " pfd.	80.00	79.00
Central Oil	60.00	55.00
Columbia	1.00	.25
Con. Coal	25.00	20.00
Doe Run	140.00	130.00
Granite Bimetallic	.35	.28
St. Joe	30.00	28.00

LONDON. (*By Cable.**) Feb. 5.

	£	s.	d.
Dolores	2	1	3
Stratton's Independence	0	7	9
Camp Bird	1	11	0
Esperanza	4	8	3
Tomboy	1	7	6
El Oro	1	7	6
Oroville	0	19	9
Arizona Copper, pf.	3	3	9

*Furnished by C. Schumacher & Co., New York.

STOCK QUOTATIONS.

NEW YORK. Week Feb. 7.

Name of Company.	High	Low	Clg.	Sales
Amalgamated	116⅝	110½	115⅝	1,346,135
Anaconda	283	270	277	194,650
Boston Copper	31	28⅛	29⅞	19,100
British Col. Copper	10¼	8¾	9¼	8,235
Federal	184	180	180	800
Federal, Pf.	109	106¼	107¼	6,000
Greene Copper	28⅜	26⅛	28	25,295
Greene Gold				
Mitchell	14	12¼	13⅛	16,320
Ontario	3¼	2½	2½	300
Tennessee Copper	47⅛	45	46⅞	3,000
Union Copper	1 1/16	1⅜	1⅜	2,110
United Copper	78	66½	78	238,500
United Copper, Pref.	104	95	98½	2,785
Utah Apex	8	7⅜	7½	2,400
Utah Copper	34⅛	32⅜	33⅜	8,565

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	169	163⅜	164½	169,450
Am. Smelting & Ref., Pf.	128¾	126	126	9,500
Col. Fuel & Iron	78¾	70	73¼	254,425
National Lead	90⅛	83	85⅞	28,600
Pittsburg Coal	16⅞	14½	15⅝	2,800
Pittsburg Coal, pf.	59	56⅞	56⅞	800
Republic I. & S.	36⅞	34	35¾	41,850
Republic I. & S., Pf	108¼	94	108¼	12,400
Tenn. C. & I.	165	155	159	10,600
U. S. Red. & Ref.	27	27	27	100
U. S. Red. & Ref., Pf.	68	67½	67½	200
U. S. Steel	46⅛	43⅝	44¾	768,565
U. S. Steel, Pf.	113	110	110½	119,025
Standard Oil	695	696	696½	269
Bethlehem Steel	35⅞	32¼	33	8,300

BOSTON.

Allouez	43½	40½	40⅝	4,235
*Amalgamated	116⅝	110	116¼	78,953
Atlantic	25¾	25	25	4,270
Bingham	49	38½	44½	94,654
Boston Consolidated	31	28	28½	15,410
Calumet & Hecla	705	700	700	284
Centennial	29½	28	28	1,048
Mercur	65	64	65	1,925
Copper Range	84	82	82	9,603
Daly-West	17¼	16	16⅛	1,830
Franklin	19½	18¼	19	24,060
Granby	10¼	9¾	10⅛	3,544
Green Con. Copper	28⅛	26⅜	27⅞	8,892
Isle Royale	26½	24⅝	24⅝	2,960
†Mass	10⅞	10	10½	1,140
Michigan	17	14½	15¼	3,115
Mohawk	59	58	58¾	830
North Butte	89	86	87	10,727
Old Dominion	38¼	36¾	38	1,970
Osceola	102⅛	100½	100¾	1,734
Parrot	43⅛	40	41	5,027
Quincy	110	103½	106	469
Rhode Island	7⅛	6	6	2,744
Shannon	6⅜	6	6	2,375
Tamarack	108	107	108	57
Tecumseh	15½	13¼	14	4,356
*United Copper, com	77⅞	66⅞	74½	34,430
U. S. Smg. & Ref.	61¾	57½	58¾	9,602
" " pfd	46	44½	44⅜	12,482
Utah	66⅞	64½	64½	12,669
Wolverine	133	131	132	142

PHILADELPHIA.

Cambria Steel	36⅝	34¾	35½	21,661
Philadelphia Co.	53½	51⅞	53	9,434
Tonopah	19	18¾	18¼	2,799

PITTSBURG.

Crucible Steel	17	16¼	16⅜	2,906
Crucible Steel, Pref.	80	79¾	79¾	3,151
Tonopah Ext.	8.55	7.50	8.50	9,530

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton	46	46¼	46	46
El Paso	93¾	97½	84¼	84¼
Isabella	24½	24¾	24⅛	24¾
Portland	185	185	180	185
Vindicator	92	92	90	90

SAN FRANCISCO.

Best & Belcher	1.10	1.25	1.10	1.25
Bullion	.20	.24	.20	.20
Caledonia	.42	.47	.42	.43
Confidence	.75	.75	.70	.70
Con. Cal. & Va	1.25	1.25	1.20	1.25
Gould & Curry	.17	.18	.16	.17
Hale & Norcross	1.00	1.00	.90	.90
Mexican	1.20	1.25	1.15	1.25
Occidental Con	.92	.92	.92	.92
Ophir	6.12½	6.37½	6.00	6.00
Savage	.49	.49	.40	.40

*Ex-dividend. †1st Installment Paid.
Assessment Paid. §2d Installment Paid.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.023	.....	28.047	.....
March	58.046	.....	26.794	.....
April	56.600	.....	26.108	.....
May	57.832	.....	26.664	.....
June	58.428	.....	26.910	.....
July	58.915	.....	27.163	.....
August	60.259	.....	27.822	.....
September	61.695	.....	28.528	.....
October	62.034	.....	28.637	.....
November	63.849	.....	29.493	.....
December	64.850	.....	29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	New York.				London.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.310	15.128	18.413	68.262	78.896
Feb.	15.011	.....	15.136	.....	67.963	.....
March	15.125	.....	15.250	.....	68.174	.....
April	14.920	.....	15.045	.....	67.017	.....
May	14.627	.....	14.820	.....	64.875	.....
June	14.673	.....	14.813	.....	65.881	.....
July	14.888	.....	15.005	.....	66.887	.....
Aug.	15.664	.....	15.725	.....	69.830	.....
Sept.	15.965	.....	15.978	.....	69.667	.....
Oct.	16.279	.....	16.332	.....	71.406	.....
Nov.	16.599	.....	16.758	.....	74.727	.....
Dec.	18.328	.....	18.398	.....	78.993	.....
Year.	15.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	29.325	36.390	July	31.760	.....
Feb.	29.262	.....	August	32.8 6	.....
March	29.523	.....	Sept	32.095	.....
April	30.525	.....	Oct	32.481	.....
May	30.049	.....	Nov	33.443	.....
June	30.329	.....	Dec	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	4.552	5.600	July	4.524	.....
Feb.	4.450	.....	Aug.	4.665	.....
March	4.470	.....	Sept.	4.850	.....
April	4.500	.....	Oct.	4.850	.....
May	4.500	.....	Nov.	5.200	.....
June	4.500	.....	Dec.	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton.

SPELTER.

Month	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	6.190	6.487	6.032	6.337	25.062	28.225
Feb.	6.139	.....	5.989	.....	24.594	.....
Mar.	6.067	.....	5.917	.....	23.825	.....
April	5.817	.....	5.667	.....	23.813	.....
May	5.434	.....	5.284	.....	23.594	.....
June	5.190	.....	5.040	.....	23.875	.....
July	5.396	.....	5.247	.....	23.938	.....
Aug.	5.706	.....	5.556	.....	24.675	.....
Sept.	5.887	.....	5.737	.....	26.375	.....
Oct.	6.087	.....	5.934	.....	28.225	.....
Nov.	6.145	.....	5.984	.....	28.500	.....
Dec.	6.522	.....	6.374	.....	28.719	.....
Year.	5.882	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.